

# Radio Fun

"The beginner's guide to the exciting world of amateur radio."

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## Radio Astronomy

Radio astronomy can be done on any frequency that's free of terrestrial radio signals. There are many types of celestial radio emitters which generate noise (generally wideband noise). At the lower frequencies the emissions are dominated by non-thermal mechanisms. For example, the planet Jupiter is a very strong emitter of radiation in the 5-39 MHz range. Indeed, much of the background noise you hear on HF is quite often dominated by these signals.

At higher frequencies, you get continuous emission from interactions between free electrons, again producing broadband noise. You also get spectral line emission from atomic recombination and molecular transitions.

If you have an OSCAR station, and you want to do a simple exper-

## Southeastern Community College Rocket Flight

In mid-October, students at Southeastern Community College in Whiteville, North Carolina, plan to fly their 11-foot rocket into space. As part of their electronics course, the students built a 73-pound rocket which they plan to fly up to over 300,000 feet. To achieve this altitude, they will lift the rocket up to 80,000 feet via a large balloon and ignite it by a remote radio command. Since this is above most of the Earth's atmosphere, the rocket should fly to incredible heights.

The rocket will carry a 2 meter packet beacon on a frequency of 144.440 MHz FM. Listen for telemetry information on this frequency every 20 seconds during the flight. Also, two ATV (Amateur Television) transmitters should send back spectacular views from the edge of space from a color camcorder and a B/W miniature camera. Look for these on 439.25 MHz (AM standard TV)

and 1255 MHz (FM TV). Those of you who have cable-ready TV sets or VCRs can tune into the rocket video signals by tuning in cable channel 60 (be sure to attach an external antenna to your TV or VCR). Anyone living within 400 miles of Wilmington, North Carolina (the launch point), should receive the rocket signals during the balloon ascent. During the rocket flight to space, anyone within 700 miles may have a chance. An HF information net can be heard on 7.155 MHz during the flight. Lift-off is tentatively scheduled for 6 a.m. Eastern time. Announcements of the actual launch date will be issued on the AMSAT net (every Tuesday night at 9 p.m. Eastern on a frequency of 3.840 MHz) or the ATV net (every Tuesday night at 9 p.m. Eastern on 3.871 MHz). Look on your local packet BBSs for any updates as well. *Bill Brown WB8ELK, Editor.*

Photo. The Southeastern Community College Rocket. (l to r):  
Simms Spears, David Couvillon KC4WDW, and Ben Frink KD4BFG.



## Students Track DOVE

Chaminade College Prep in West Hills, California, is one of the schools most active in satellite operation. Physics instructor Dave Reeves KF6PJ has developed a set of experiments to challenge his advanced students' knowledge of the fundamental concepts in physics. Laura Waggoner, one of his students who has been watching DOVE telemetry, has concluded that DOVE's spin rate has slowed considerably. Microsat command station operator Jim White WDØE, well-known for his Microsat motion studies, reports: "I have not been watching DOVE closely, and so cannot confirm Laura's observations. The question is not idle, because WEBER has slowed considerably, and while several theories are floating around, none can fully explain why. If DOVE has also slowed, it would be very valuable input to the mathematical models of spin rate several people are trying to build."

Teachers and students who would like to participate in satellite operation and other exciting OSCAR activities in their schools are advised to contact Rich Ensign N8IWJ, AMSAT Science Education Advisor, 421 N. Military, Dearborn MI 48124. *TNX Westlink Report, Number 604.*

## WB2JKJ Classroom Net

For the last 11 years, radio amateurs have been meeting on the Classroom Net to share ideas regarding education, and to speak to young people, broadening their understanding of the world and increasing their desire to come to school. The Net meets on 7.238 MHz at 1100 UTC to 1230, then 1300 to 1900 UTC on 21.395 daily. With the addition of packet radio, EDUCOM will be a part of each Net, and discussed daily. The Net invites hams with a General Class license or higher to join Net discussions whether they are in a classroom or not. Novices, Techs, and SWLs are asked to listen and send in their questions and topics for discussion. If Net Control in NYC cannot be copied, look for one of the several relay stations around the country. *TNX Westlink Report, Number 604.*

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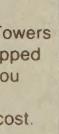
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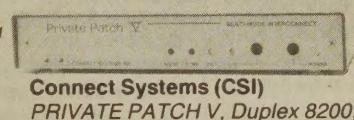
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The response to the premier issue of *Radio Fun* was overwhelming! Frankly, we weren't ready for the number of subscription orders. In order to fulfill our promise, we had to print an extra 10,000 copies of the premier, just to send to pre-publication subscribers.

Judging from my mail, it seems that a magazine like *Radio Fun* is long overdue and much needed. Hundreds of you have taken the time to write and express your support. We love getting your letters, so don't stop writing. Remember . . . it's YOUR magazine. Let us know what you want to see. We can't be everything to everyone in every issue, but if a good idea comes along, we'll do our best to get it into a future issue.

### Too Many Ads?

Several letters mentioned that *Radio Fun* seemed to be too full of ads. Actually, the premier issue was exactly 50/50—ads to editorial. This is considered the goal of any magazine, so we were kinda' surprised when about 8 or 10 readers thought we were

too ad heavy. I think the confusion comes from the fact that *Radio Fun* is a tabloid. Since a tabloid's pages are much larger than a regular size magazine (45% larger, to be exact), it allows us to get a bit more creative with the page layout. We tried laying out the pages like "standard" magazines—with whole pages of text and opposing pages of ads—but it looked awful. By using the extra space provided by a tabloid page and placing ads on editorial pages, the magazine looks a lot more exciting. It's not that there are more ads, it's just that we've spaced them out.

Don't worry. The more ads we get, the more editorial pages we'll run. The ratio will always hover around 50/50.

### While We're On The Subject Of Ads

Don't forget . . . ads are what pay for a magazine—not subscribers. The subscribers attract the advertisers, so it's really a symbiotic relationship, but the income from ad sales is what pays most of the bills. So, the more advertisers we have, the more editorial pages we can print. An easy way to think of

it is this: every page of advertising buys a page of editorial.

This is where you come in. If you let advertisers know that you saw their ad in *Radio Fun*, they will keep advertising. If you let nonadvertisers know that you read *Radio Fun*, they will start advertising. If you like *Radio Fun* and want it to grow, make a special effort to support the advertisers . . . AND TELL THEM!

We've started including a reader service card in this issue. Right now, before you go any further, find the card and rip it out. Now, as you go through this issue, circle the reader service number of every advertiser whose products you are even mildly interested in. When you get to the end of the magazine, immediately drop the card in the mailbox. Don't wait. Do it now. Many of you are newcomers to amateur radio, so I know that you're just starting to set up your stations. Whether you're into HF, repeaters, satellites, microwaves, ATV . . . anything. You'll find products and retailers advertising in *Radio Fun* who want to send you information.

One of the biggest things influencing an advertiser is reader service response. If they get several hundred requests for information, they know their ad is working. If they get one or two requests, they'll probably start thinking of pulling their ad.

It's up to you.

### Gotta' Question?

A lot of you have written with questions. We hope that all of you will feel free to write when you're puzzled by some aspect of ham radio.

To make things easier, try to address your query to a particular author or columnist. Technical questions should go to Michael ("The Tech Side" columnist). Questions about ATV should go to Bill. Questions about licensing should go to Gordon. Feel free to write to any of us, but the columnists already have a forum where they can answer questions: their columns.

We can't always promise a personal response, so your best bet is to address your questions to the person who you think will be able to answer it

quickly. Also . . . columnists are always looking for topics, and your question just might spark a whole column.

### Send Photos

We sent out hundreds of free copies of the premier issue to radio clubs and licensing classes. So far I haven't seen a single photo!

We want to run as many photos as we can, so take a picture of your licensing class and send it in. Take a picture of your son/daughter/grandchild/wife/uncle/ holding their new license, and send it in. Take a picture of hams doing fun things and send 'em in.

### Infrequent Editorials

You won't hear from me every month. I'd much rather have a construction article here than more rachet-jawing from me. Unless I have something of at least minor importance or significance to say, I'll keep this space open for your letters and photos, news items or another article or review.

73 'till next time . . .

## Rehab Radio Returns

Rehab Radio returned to Childrens Hospital in Orange County, California, on April 27, 1991. About a dozen young patients took part in the event in the hospital playroom. Using a UHF-to-10 meter link, the kids and their therapists were thrilled by contacts with Johnson Island, Saipan, and Perth, Australia. The young patients were also treated to some leisurely local contacts on 2 meters with KK6YE, N6ZSQ, and several others. TNX WA6OPS via *Westlink Report, Number 604*.

## World's Youngest Ham?

Curt Harrington N5HME and his wife Ann N6YGP believe that their daughter Veronica may be the youngest ham licensed in the United States—if not the world. Veronica, age five, has been issued the callsign KC6TQR after passing her Novice test on March 17, 1991.

According to information provided to N5HMS by the ARRL (American Radio Relay League), since 1983 there have only been 11 Novice and one Technician Class licenses issued to kids five years of age or younger. No Novice licenses have been issued in this age group since 1983. This would suggest that Veronica Harrington is the youngest Novice in the United States, and possibly the youngest ham anywhere in the world. TNX *Westlink Report, Number 603*.

## Young Hams Take Over!

*Editor's Note: Did you QSO anyone on the Youth Net from 0001Z August 3 through 2359Z August 4? If you worked all three stations listed below, the Youth Net has a handsome certificate for you. Send three QSL cards, three contact numbers, and a 9"x12" SASE to Sammy Garrett AA0CR, P.O. Box 5832, St. Louis MO 63134. For one or two contacts, send your QSL cards and contact number(s) with a legal size SASE. Below is the story of how the Youth Net and August Special Event was formed. See the Premier issue of Radio Fun, page 28, for the story of Sammy AA0CR's appointment as the 1991 Westlink Report Young Ham of the Year.*

In his *Westlink* column, Sammy AA0CR writes: "During one of my brainstorming sessions with my father, NØMAL, we came up with the idea of an HF Youth Net done for young hams by young hams.

"So I called upon last year's Young Ham of the Year, Mary Alestra KB2IGG, to ask for her comments and suggestions. After a short conversation, we came up with some ideas for the net, and we decided on what we think will be an outstanding kickoff event.

"Mary and I both felt that a Special Event Station celebrating youth in amateur radio would not only make people aware of the new Youth Net, but just might bring some young hams out of the woodwork with the hope of working someone their own age for a change . . . but our goal was also to give everyone, in all parts of the world, an opportunity to work the Special Event Station.

"Our solution: have stations in more than one area of the country. Mary could operate from New York City on the East Coast, and I could operate from St. Louis in the Midwest. But we needed someone else to operate from the West Coast. We turned to young Fullerton, California, DXer Darrel Craig KK6BB, and he enthusiastically agreed to be our third operator."

## ARRL DX-QSL Bureau

by John Thompson K6OHM

I have been a volunteer for the ARRL DX-QSL Bureau for about two years, and in that time, I have noticed several things about DX QSLing which may be of help to the readers of *Radio Fun*. For cards being sent to DX stations through the foreign QSL bureaus, the following suggestions may bring success to the card getting to the right ham.

- 1) Fill out the card legibly. Remember the QSL will be read by someone who may not write the call letters the same as we do in the U.S., so be careful not to be sloppy in writing. I have many QSLs from foreign countries that I am still trying to decipher for this very reason.
- 2) Always write the ham's name as given to you in the QSO (first name only is OK) on the QSL card somewhere. I have been able to determine call letters on difficult-to-read QSLs by just seeing the person's name on the card, and being familiar with names and callsigns, I was able to direct the card to the right person.
- 3) Keep at least two envelopes and a couple of extra dollars for excess postage at the bureau for your section. My files are set up to handle at least five envelopes per station and it keeps the storage of cards waiting for envelopes to a minimum if you already have some on file.
- 4) Envelopes mailed to the bureau should be a number 35 or the equivalent 5" x 7 1/2". QSLs are too large for smaller envelopes and larger envelopes don't fit in our files.
- 5) Send envelopes to the bureau with at least the

minimum postage already on them (currently 29 cents). Because we don't know when cards will be received, many envelopes are sent out with five or fewer cards, and having the minimum postage saves the volunteer a lot of time in stamping these envelopes.

6) Some people prefer to wait until their envelope has enough cards in it to use the full amount of the postage, while others want any cards received to be mailed to them immediately. If you have a special request, please let the bureau know, and it will be acted upon accordingly.

I really enjoy my monthly volunteer work in distributing QSL cards and I spend about 12–15 hours each time to sort, package, and mail from 2000–3000 cards to more than 600 people. The one side benefit is seeing all the QSLs I missed (Hi!) and touching some rare DX QSLs. Some take a long time to get to the bureau (oldest I've seen was for a QSL 10 years ago!). I envy some operators who have been successful in contacting a sought-after DXpedition, but from seeing these cards, I also learn for my own information what times and frequencies the stations may be operating.

As in many areas of ham radio, Elmers, VECs, League officials, radio club officers, etc., our hobby exists because fellow hams take their personal time to volunteer their skills to the rest of the hams. Your volunteer efforts would be most appreciated in whatever area you feel could use the help the most.

RF

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Forest Road, Hancock NH 03449.

RADIO FUN (ISSN 1055-887X) is published monthly by Radio Fun, a division of Out to Launch Communications, Inc., Forest Road, Hancock NH 03449. Charter Subscriptions: \$9.95 per year Canada add \$7.00 plus 70¢ GST. Foreign add \$12.00 surface, \$32.00 airmail. Second class postage pending at Hancock NH and additional mailing offices.

POSTMASTER: Send address corrections to RADIO FUN, P.O. Box 4926, Manchester NH 03108.

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## letters

**Larry Woram VE3WLN, Ogdensburg NY** I would like to take this opportunity to thank you for your excellent magazine, 73, and for having the insight to publish *Radio Fun*. I look forward to receiving my subscription to it as well.

As a recently elected member of the executive [part] of the Ottawa Valley Mobile Radio Club, the other members and I are actively working towards promoting amateur radio as a hobby for all ages, with emphasis on youth. We also recognize the need to provide support to those who are newly licensed, to ensure that they are not left on their own and lose interest. We feel that *Radio Fun* may be just the vehicle to help accomplish these goals.

**Frank Coop KA0QQR, Newton KS** I found *Radio Fun* interesting and informative. Congratulations—a publication such as this was long overdue. But why so many ads? Do you really need all of them?

When you publish a photo of a person's shack, why not also add a note calling out the main items of gear? I'm sure many hams would find it very useful. I know I would. Besides, it would save me from having to count knobs and dials! I even get a tad touchy when the photo isn't distinct enough for counting.

*Frank, advertisers not only serve readers by keeping them informed on what's available in the market, they also pay for most of the costs of publishing a magazine. To pay for itself, a magazine generally needs to be about half ads, half editorial. Or would you rather pay a few hundred dollars (maybe more) for a subscription to a magazine without ads?*—Eds.

**Doug KL4RSL, Athens GA** Thanks for the always fantastic 73, and thanks for what looks like a future winner—*Radio Fun*! In case you're looking for suggestions, how about some articles on nets (both code and voice) and how to get involved?

**Warren Rowe N5TFL, Temple TX** I received the premier issue of *Radio Fun* just recently. I am IMPRESSED! It is exactly like you advertised it to be: for the Novice/Technician class license operators. I applaud your efforts, and will support this magazine as long as it's in print.

I have two ideas for upcoming articles in *Radio Fun*. One is to explain the procedure by which licenses are given out. The second idea is to maybe come up with a special segment for "Elmer of the Month." And how about an article on storm-spotting and weather nets?

**Jerry Haislip, Roanoke VA** Just received my premier issue of *Radio Fun*. Needless to say, I was excited to get the first issue, and have read it from cover to cover, enjoying each page. After waiting 30 years to get the time and means, I have now decided to give amateur radio a try. The code might have been a deterrent in my younger days, but I've started my new hobby with the code tapes anyway. I like the

idea of the no-code Technician license, and it's likely what guided my interest back to amateur radio after all these years. I'm looking forward to each issue of *Radio Fun* and having a call sign to put behind my name.

**Vernon Heglund KB0IGS/KT** I thank the good Lord for people like you, Wayne Green and staff, for remembering us new hams, and publishing a magazine for us. I met my wife Barbara on the 2 meter band in Minneapolis 37 years ago when I visited a friend who was a ham (WØOFY). We tuned up his rig one night, and heard these two ladies on the band—talked with them, and then went over to see what kind of ham rig they had. I ended up marrying Barbara 6 1/2 months later. Barbara was visiting a friend who was a ham (WØPYC), too.

After our marriage, we got busy building a home together and raising a family, and made a few attempts to get our Novice tickets, but just didn't have the right timing. Just before retirement this year, I was challenged by a ham at work, and after six months of study, on and off, I purchased Gordon West's Radio Shack materials and found an Elmer. I should have my General class by year's end. I feel like you folks have welcomed my wife and me to ham radio with your first issue of *Radio Fun*.

**Andrew Eschenauer** I'd like to say that one can't have enough product reviews in a magazine. I love reading reviews. And anything about antennas, feedlines, connectors. I'd like to see a nice article on attaching various connectors (F, BNC, TNC, PL, etc.) to various coax cables. And I've never seen an informative article on exactly how much signal loss there is when using connector adapters. Or a comparison of standard vs gold adapters. If you could come up with an article like that, heck, I'd eat it up!

**Dellena Montano KC6TIO, Downey CA** I just received my no-code Tech license in February. One older ham made a sour face when I told her that I'm no-code, but it didn't hurt my feelings. Anyway, I'm studying code and really enjoying it. I probably never would have gotten into the hobby the old way because I thought code was too hard (my husband has an advanced license). But my 15-year-old daughter and I went to Gordon West's class and enjoyed it so much (and passed) that I really got interested. I passed the General theory in March, and am now beating my brains out learning the code. I have the Advanced theory book, too.

I have my first issue of *Radio Fun* and wanted to share my ideas with you. I would really like to see a page for women in radio (I'm 47, no previous technical interests), a page all about the kids who have become hams, and some articles on "the most fun I've had as a ham." Maybe "Ham Pals" (like penpals). Funny stories would be good, too. Pictures, diagrams, and charts of ham shacks would be great.

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# Collect Those QSL Cards—

## Decorate Your Shack with Awards

by Frank L. Strieg 7J1AAL/KA2TNZ

Collecting awards is interesting and fun. Literally hundreds of clubs and radio organizations worldwide offer thousands of different certificates,

a little, and state that you meet the requirements for a particular award when in reality you don't. Nobody else would know, but you have to live

specific geographical or political region by working members of a club, working stations within a specified time period, or by spelling out a certain phrase with first/last letters of the calls of stations worked. Some of these awards are very easy to get, while others are more challenging. How about working the same five DXCC stations each on five different bands, for a total of 25 contacts? Try it. It takes time. Or spell "Amateurfunk Bruecke zur Welt" with the tail letters of QSLs you have. Work five HL9s in the same mode. Work stations in countries through which Marco Polo passed en route to China. Work Jordan's King Hussein (JY1) and 10 other Arab nations, and you can receive a beautiful certificate. Help three hams put up their antennas and you can get an award for it. Spell out your callsign with the

you closer to the awards you are chasing.

Applying: Once you have met the

confirmed. This is your GCR. Have two fellow amateurs certify that you have the cards in your possession by signing and dating the form on the bottom. Some awards directories (K1BV, for example) have a form already made up for you, and all you have to do is make copies and fill them out.

Be careful: For a few awards (DXCC, WPX), you must send the QSLs in for verification. For other awards, DO NOT send your cards in un-



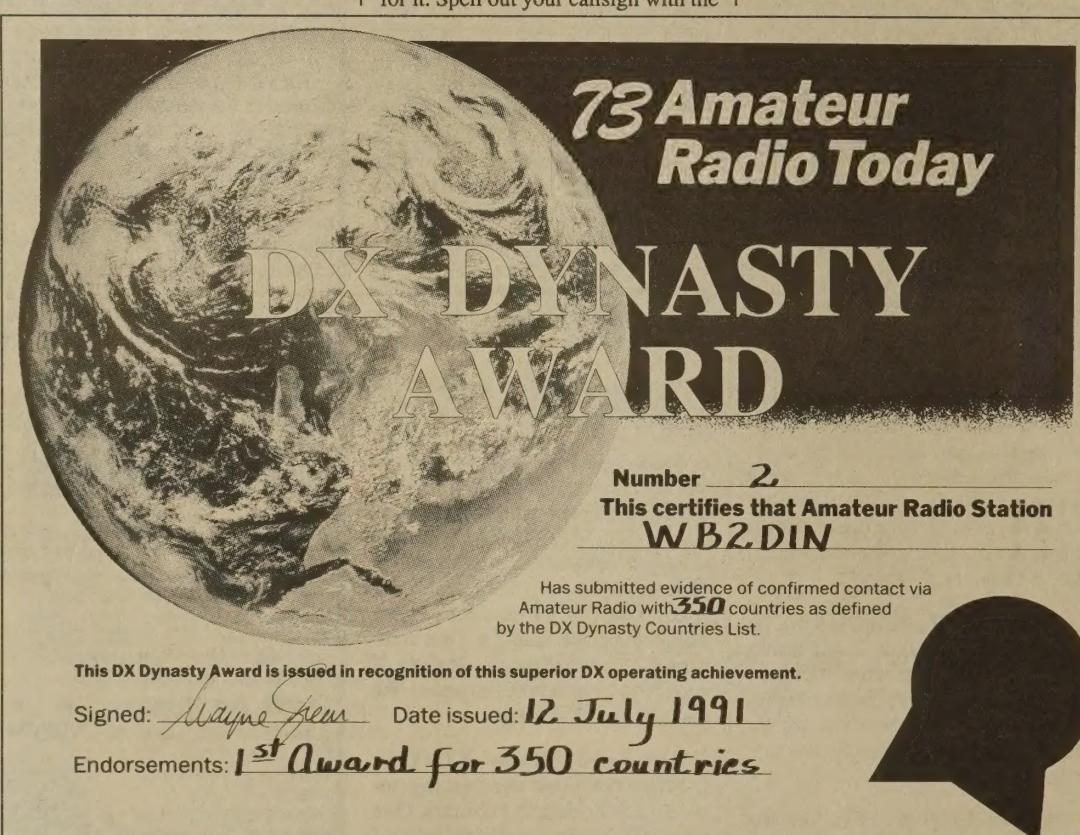
plaques, trophies, pennants, and other ham memorabilia if you meet the requirements of their specific award. An award may be easy to get, by simply working and confirming a few stations, or it may take years to achieve because that one last QSL is long in coming.

The premiere award for hams worldwide is the DXCC. But did you know that when you meet the requirements for this award, you also become eligible for several other awards? 73's DX Dynasty Award, a beautiful certificate, is one among several others you can get for just working and confirming 100 or 101 countries: 101 Award (LU), United Nations Award (USA), etc.

Interested? You can start by working DX. Work lots of DX, and religiously QSL all your contacts. As the months go by, you'll start filling up your shoebox.

**Proof of contacts:** Almost all awards (with few exceptions, such as the ARRL Golden Jubilee Award in 1987) require you to actually have in your possession the QSLs you are using to claim the award. The fact that you have the QSLs must be certified, in most cases by two fellow hams. This practice is known as the General Certification Rule, or GCR. In the case of a few awards, the GCR list must be certified by your national radio organization, i.e., the ARRL. Award rules usually state the requirements quite clearly.

**Honor:** Like fishing, it seems it would be possible to stretch the truth



Bob Reed WB2DIN has managed 73's DXDA Awards Dynasty for more than five years!

with yourself. It's simply dishonest to falsely claim an award you don't deserve.

**Requirements:** Generally, you can get awards for working stations in a

tail letters of ham and SWL stations and get a certificate. Collect 10 different awards and you can receive an award for that, too!

**Keeping track:** The list goes on and on. But how can you remember which awards you are following? If you are only chasing a few, there is little problem. Since getting interested in awards two years ago, I tracked my progress on over 100 awards, and have found that a loose leaf notebook, with a separate sheet for each award being tracked, is very useful. A brief note about the requirements for the award, along with a list of the stations worked (in pencil) and confirmed (in ink) will keep you up to date on how close you are to applying for the award. When your QSLs come in, you just make ink entries of your QSLs on the appropriate awards page to see which ones will bring

**Tony Rycko**  
**53 Buckingham Drive**  
**Jackson, New Jersey 08527**  
**U.S.A.**

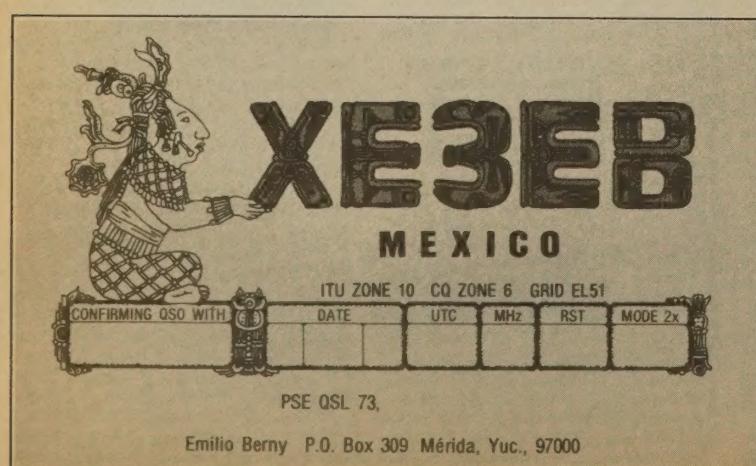


QSO WITH	CONFIRMING QSO						
	MONTH	DAY	YEAR	GMT	MC.	RST	2 WAY

less the rules specifically tell you that you must. Usually a GCR will suffice. If you must send the QSLs (and these took you months, maybe years, to accumulate, remember?), be sure to send them by registered mail, and to include enough payment for return postage so that you can count on them being returned to you.

**Sending in the award application:** Usually there is a nominal fee for each award. IRCs are the easiest method of payment, and the number required for the award (anywhere from 5 to 10) is noted in the award rules. Green stamps also work for payment in some countries. When I am out of IRCs, green stamps work fine, although it is riskier to send them through the mail, and even illegal in some countries. With your GCR statement, payment, and a brief cover letter, you can now mail your application. Sometimes a sticker with your mailing address on it, if large enough, will also help the awards manager in getting your application processed sooner. If you are sending payment to a country where you think the reliability of the postal system is questionable, you are better off sending your application packet by registered mail. You can even have the post office send you a postcard advising you when the letter was delivered. This is called an "avis de reception" (A.R.) in many countries.

For some obscure awards, especially the overseas ones, you might find it a good investment to check with the award manager by postcard, just to



confirm that the award is still available and that he/she is still the current manager. Information becomes quickly out of date in award directories.

**Waiting:** Award managers are hams, and receive no pay for their efforts. They also have to work for a living, have families, friends, and all the other concerns that we all have in our daily routines. What this means is that they will do their level best to get your award out to you as soon as possible, although sometimes it takes a while to get the awards signed (you wouldn't want an unsigned one, would you?) and prepared for mailing. After all, ham radio is just a hobby. Delays are sometimes inevitable. If this happens, be patient. If there is still no news (some DX awards can take up to six months), a follow-up letter would be in order.

**Sources of information:** The *KIBV DX Awards Directory* is the most comprehensive I have seen. Published annually, the 1991 edition contains over 1700 awards available worldwide, many of them from exotic DXCC QTHs. In an effort to keep entries current, award managers who do not reply to inquiries after a few tries are dropped from the listing. For U.S. addresses especially, it's well worth the \$17.50 charged. The cost for Europe, Africa and S. America is \$22 airmail; for Asia, Oceania and the USSR the price is \$25 airmail. Shipment to any DX location by sea is \$16. There are 243 pages. Write K1BV DX Awards Directory, Ted Melinosky, K1BV, P.O. Box 960, Keene NH 03431-0960.

A unique type of directory is *The International Awards Guide Book*, published by YBØWR. Cost is rather steep



at \$37 by air, but then all pages are in color, with illustrations of almost all of the 750 awards it lists. Mr. Lumban Gaol is a printer by profession, so I am sure that publishing this 422-page directory is a labor of love. The International Awards Guide Book, M.S. Lumban Gaol, YBØWR, Jl. Garuda No. 62, Jakarta 10620, INDONESIA.

The Radio Society of Great Britain (RSGB) publishes *Amateur Radio Awards*, listing some of the major awards available. Area maps, as well as illustrations of the awards, are given. Cost was \$12, but I have no idea what the current price is. ISBN: 0 900612 49 5, 80 pages. Write Amateur Radio Awards, RSGB, 35 Doughty Street, London WC1N 2AE, ENGLAND.

*The Award Hunter's Guide*, published by the Japanese *CQ Ham Radio* magazine, is worth noting here because it lists many Japanese awards

that most hams in the world don't know about. Over 500 awards are listed, many illustrated in color. Although an excellent guide, it is, unfortunately, 95% in Japanese. It costs the current equivalent of about \$12, plus about

\$8 for airmail (\$3.50 for surface) postage. If you cannot get a copy of this guide locally, contact me at my callbook address, and I will try to help you. 212 pages.

Another interesting source of information is the "DXNS" series of pamphlets published by Geoff Watts, editor of the "DX News Sheet" from 1962-1982. Geoff has four very comprehensive lists: the CQ and ITU Zones Guide, USSR Oblast Guide, DXCC Countries Guide, and Radio Amateur Prefix-Country-Zone List. The ITU zones list is useful in that it will help you keep track of which zones you have confirmed for the ITU WAZ award. Write DXNS Guides, Geoff Watts, 62 Belmore Road, Norwich, NR7 0PU, ENGLAND.

Now, what are you waiting for? Start working DX and get started on those QSLs!

RF

Frank L. Strieg, 4-39-7-503 Kaminoge, Setagaya-ku, Tokyo 158 JAPAN.

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TH-47A	70CM 2.5W MICRO	429.95	CALL
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TM-851A	70CM 25W ALL-MODE	771.95	CALL
TS-711A	2M 25W ALLMODE BASE	1059.95	CALL
TS-790A	2M/70CM SATELLITE	1999.95	CALL

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TS-690S	HF/6M COMP GEN COV	1549.95	CALL
TS-450S	HF DELUXE COMP	1349.95	CALL
TS-440/AT	HFDEL COMP TUNR	1549.95	CALL
TS-850S	HF 12V DEL DDS	1699.95	CALL
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HT'S

MODEL

DESCRIPTION

LIST

OURS!

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MODEL

DESCRIPTION

LIST

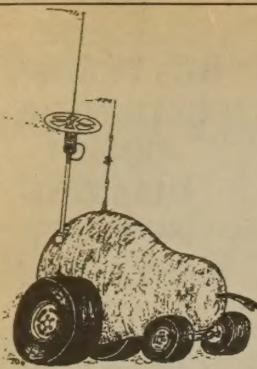
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Impedance: 50 ohms

VSWR: 1.5:1 or less

Max. Power: 120 watts

Length: 5'

Connector: UHF

# Two Meter Quad

Or any meter, for that matter . . .

by Joel Fream WA6HNO

The quad antenna is cheap, clean, easy and effective. Many of the problems that the amateur must deal with when building an antenna system do not exist with the quad. No impedance matching is required, and the spacing of the elements is not critical, yet the performance is as good as or better than other systems of similar size.

The driven element is one wavelength long. This is true for any band you want to operate on. On 80 meters, it's a little hard to hold up—264 feet

a more reasonable 82 inches long, or 20.5 inches on each side. Keep in mind that the driven element is one wavelength, and that you can build a quad for any frequency you choose. The formula is  $L_{FT} = 984 + F_{MHz}$ .

The driven element is the element of the antenna that connects directly to the feedline. In our quad, the driven element is fed with 50 ohm coax, which is really nice for the modern ham with his commercial radio designed for 50 ohms. Therefore, no

Element spacing will, however, affect the impedance of the array. SWR (standing wave ratio) adjustments can be made by changing the spacing. For 2 meters, an element spacing of 14 inches should provide an acceptable match at 50 ohms.

### Directors

You can add directors to the array with little trouble. Directors are elements added in front of the driven element. Sometimes they are called "parasitic" elements. The purpose of directors is to increase radiation.

They should be spaced like the directors on yagi antennas—slightly closer than the reflector—and they should be 5% shorter in length than the driven element.

### A Round Quad?

Although you might imagine a quad to be square or diamond-shaped, it can also be round. A round quad is called a "loop" antenna. The loop is one wavelength long.

### Feeding the Quad

The polarization of a quad is determined by the feedpoint placement. If it's fed on the side, it will have vertical polarization; if fed on the top or bottom (as shown in the figure), it will have horizontal polarization.

Most communications on the HF Novice bands use horizontal polarization. On VHF and UHF, most communications use vertical polarization, especially when working through a repeater.

As with all other factors of the quad,

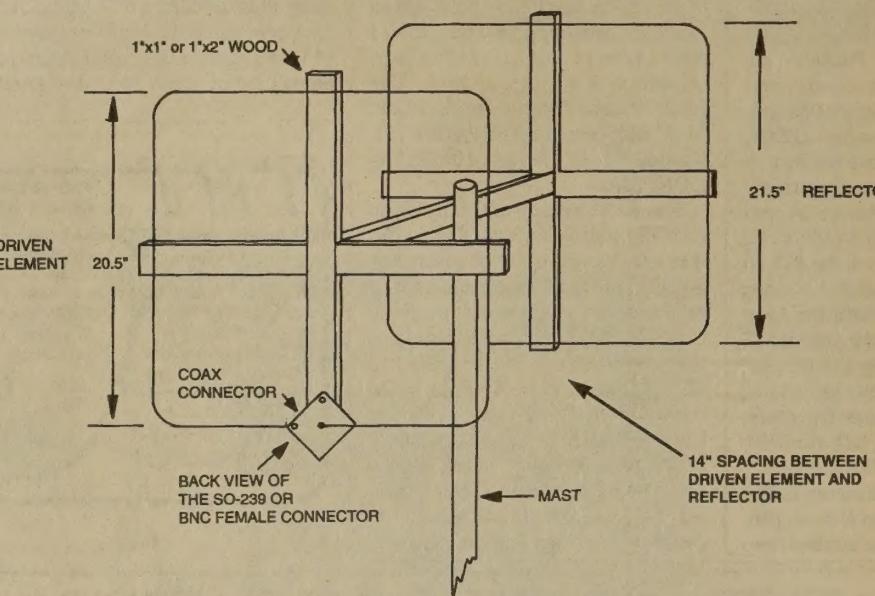


Figure 1. Overall view of the 2-element quad for 2 meters. The feedline attachment point is a female connector (SO-239 or BNC) mounted on the bottom of the driven element cross piece as shown.

long, or 66 feet to a side—but if you do build such a monster, it will work, and work well. [For more on quads, refer to the book *All About Cubical Quads*, by William I. Orr W6SAI and Stuart D. Cowan W2LX.—Eds.]

### The Driven Element

For 2 meters, the driven element is

impedance matching is required.

You can construct the elements out of small copper tubing or large, solid copper wire, and mount them on a 1" x 1" (for 2 meters) wooden frame.

### The Reflector

The reflector is one wavelength plus 5%, or  $82 \times 1.05 = 86$ . If you're quick with math and can see that the answer is really 86.1, remember that the quad is a noncritical, broadband antenna, and you don't need to be accurate to that degree.

The reflector is not connected to anything; it is a closed loop hanging

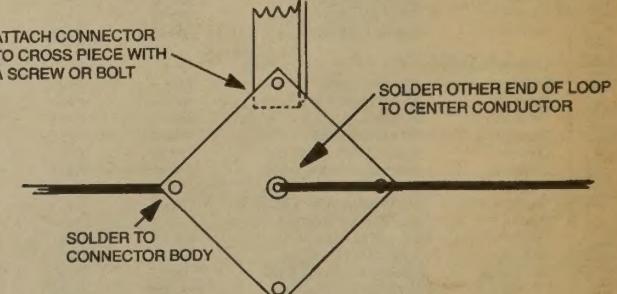


Figure 2. Detailed view of the quad's coax feedpoint (driven element).

in free space. But you must make sure that it forms a complete loop. It must have a good electrical connection where it is connected to itself. You can solder it or use screws.

### Spacing

The spacing is not critical, either. It does not greatly affect gain. Normally, the spacing will be from 0.15 to 0.25 wavelengths.

polarization is forgiving. Long-path fading due to a change in polarization is much less of a problem than it can be with other antennas.

The quad is a fun antenna. Enjoy it!

RF

Joel Fream WA6HNO at P.O.B. 1893, Broken Arrow OK 74013.  
Reprinted from the November 1990 issue of Ham News Outlet.



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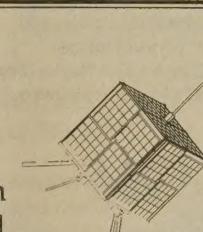
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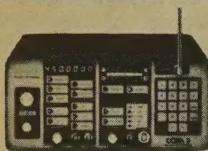


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CT-70	20 Hz–550 MHz	<50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	\$139.95
CT-90	10 Hz–600 MHz	<10 mV to 150 MHz	9	0.1 Hz, 10 Hz, 100 Hz	\$169.95
		<150 mV to 600 MHz			
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	\$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	\$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	<50 mV	Convert your existing counter to 1.5 GHz		\$89.95

## SPEED RADAR \$89.95 complete kit SG-7

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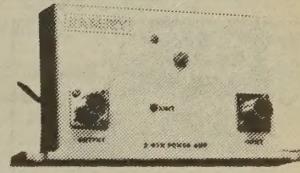
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# The "No Antennas" Antenna

## One woman's solution to problems with pesky landlords.

by Jacquelyn J. McGlothlin N9CAP

Are you one of the unfortunate few who happen to be an apartment-dweller ham? And is your landlord or apartment manager one who forbids outdoor antennas of any sort? If so, this article may be for you. The problem of erecting an antenna in a "no antennas outdoors" situation is a tricky one, indeed. This limits you to indoor an-

tennas, the logic being that what is not seen will not be noticed.

After experimenting with many different types of indoor antennas, all with disastrous results and much TVI, I finally came upon a coaxial dipole suggested by a fellow ham friend. This antenna appealed to me because of its greatly attenuated harmonics, thus lessening the TVI problem. Unlike a conventional dipole, this antenna is very broadbanded, covering from 500 kHz to 1 MHz, depending on the band used, and with an SWR of under 2:1 at the band edges.

Its broadband characteristics are due, in part, to the feedline being matched to the antenna and the electrical incorporation of its own balun, with the result that no add-on antenna tuner or balun is required. The coaxial dipole has a slight amount of gain over a conventional dipole, and since the vinyl jacket covers the entire antenna, it reduces static charge buildup considerably,

which causes a popping noise in the receiver when discharged. Thus, the coaxial dipole is a very "quiet" antenna with slightly stronger signal punch than a conventional dipole.

The antenna is simple to construct. You may use either RG-8/U or RG-58A/U coax. The latter is lighter and easier to work with. Maximum legal power can be used with either choice of coax. For antenna lengths, see Figure 1. The 40 meter antenna will be used as an example.

### Where to Begin

Begin construction by removing 2.5 cm (1") of vinyl jacket (1/2" each side of the center) at the center of the antenna. Cut the shield in the center all the way around the coax. Care must be used so that you do not cut the dielectric or the center conductor. Next, form two leads with

the shield, as shown in Figure 2. This is the feedpoint of the antenna.

From this center feedpoint, measure out each side of center 5.1 meters (16'9") and cut the coax at that point. Remove approximately 2.5 cm of vinyl jacket from each of the ends and fold back the shield so that the dielectric is exposed. Cut and remove about 2.5 cm of this insulation, being careful not to cut the center conductor. Then twist the shield and center conductor together and solder. This must be done at both ends and forms the 52 ohm matching section and balun.

### Attaching the Feedline

Any random length of coax will do for the feedline, but it must be of the same type used for construction of the antenna. Remove approximately 2.5 cm of vinyl jacket from the end of the



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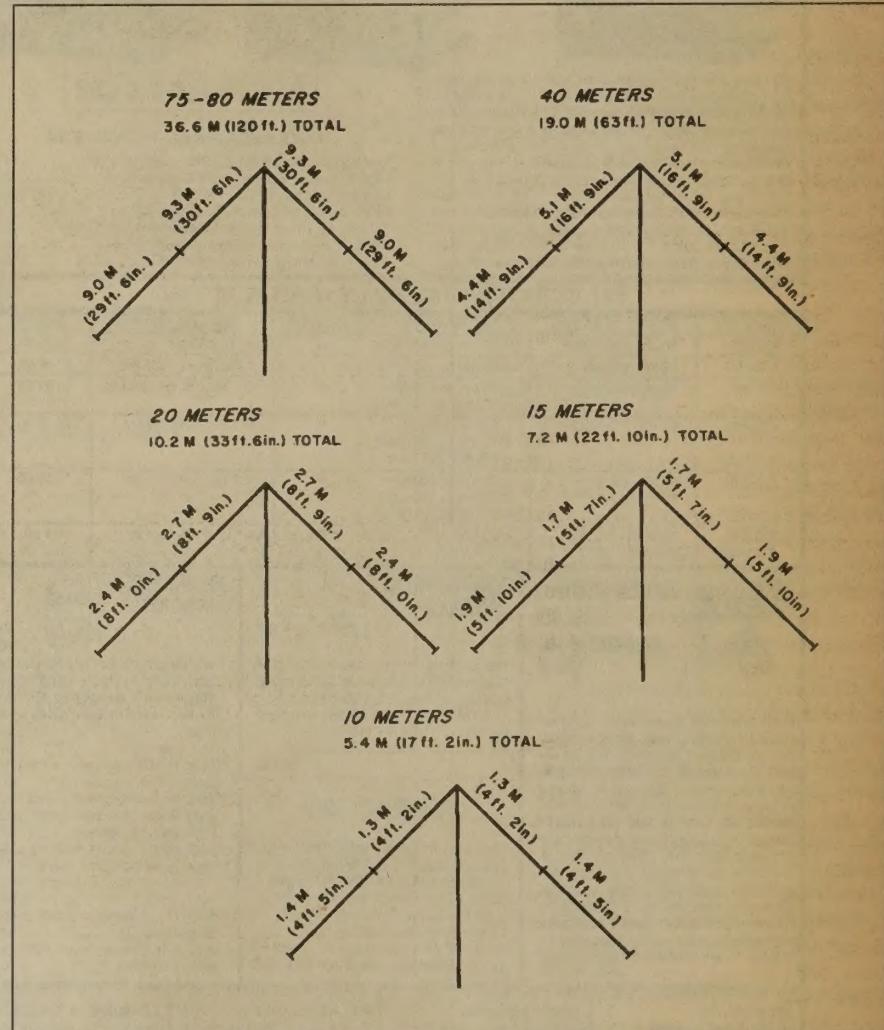


Figure 1. Antenna lengths.

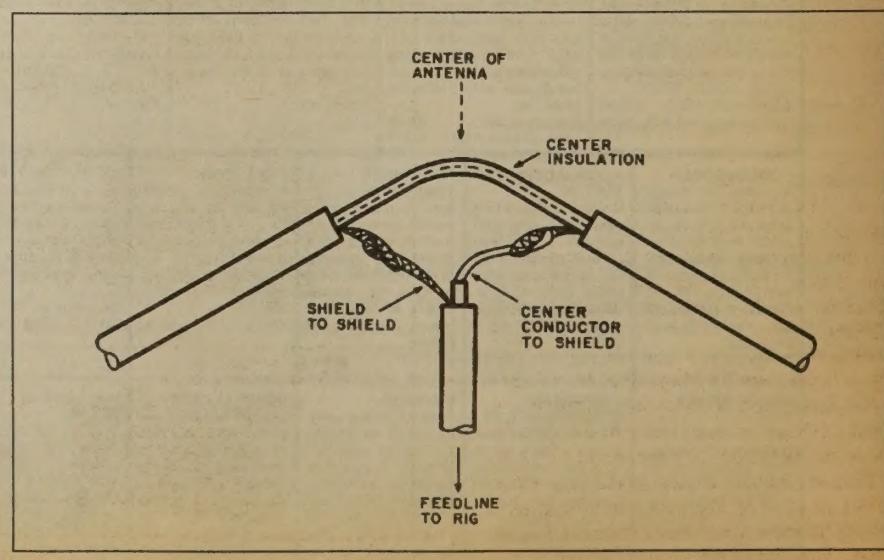


Figure 2. Feedpoint connection.

feedline, fold back the shield, and remove the center insulation. Form two leads with the shield and center conductor. At the feedpoint of the antenna, connect the feedline by soldering the feedline center conductor to one of the feedpoint leads. Then solder the feedline shield to the remaining lead. You may wish to waterproof this area, making sure that the feedpoint leads do not touch each other and short out. Follow this procedure for antennas on other bands.

If you have access to an attic or crawl space in the roof of your apartment building, so much the better. Using monofilament fishing line as anchor ties, a series of half hitches along the vinyl jacket ends of the antenna will do nicely for anchoring the antenna. The monofilament line will bite into the vinyl as it is pulled taut.

If you are not fortunate enough to have access to an attic, the antenna may be stapled to a living room or bedroom ceiling using plastic cable ties or any other non-conducting material as support. Wrap the cable ties around the antenna at intervals and staple the free ends of the ties to the ceiling. Do not staple directly through the antenna itself.

This antenna can be used as a dipole or inverted-vee. If used as a dipole, try to erect as much of it as possible in a straight line, keeping it as far away from large metal objects as feasible. The ends may hang down as long as they don't touch any nearby metal objects. More than one antenna may be erected in the same area, providing they are run at angles to each other rather than being parallel. The reason for this is that the inactive antenna could absorb some signal from the active antenna, thereby attenuating the signal output.

After erecting the antenna, check SWR and trim the ends if necessary. Be sure to twist the ends of the antenna as before (shield to center conductor), then recheck SWR. The antenna will interact with any hidden wiring in walls, so a considerable amount may have to be trimmed from each end. Once you have gotten the SWR down to an acceptable level, solder the ends of the antenna and waterproof them if you wish. This completes construction.

#### Finishing Up

Aside from a low-pass filter, no other add-ons are needed, the filter being only a safety precaution. And, since the antenna is basically omnidirectional, orientation can be determined by the space available at your location.

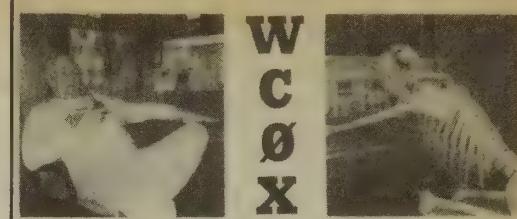
Once you start enjoying the pleasures of operating from your apartment with this antenna, you will be amazed at what you can work, and the signal reports you get with it. I have used coaxial dipoles on 10, 15, 20 and 40 meters from an apartment, and all are stapled to a ceiling in "inverted-U" fashion rather than inverted-vee. Signal reports received vary from S6 to 60 dB over S9. TVI is minimal, considering my TV is only a mere 10 feet from the antenna and I run 200 watts PEP.

With these coaxial dipoles in use for over two years now, I have gotten Worked All Continents, Worked All States, and DXCC with 121 countries worked to date. So there's no telling what you can do with this antenna and you may be pleasantly surprised at the results. It sure beats non-operating just because you live in an apartment! Happy DXing!

RF

## Hams Stricken by Mysterious Ailment

Hams have become victim of a strange sickness, medical researchers say (see photo). The first case was reported as a 27-year-old amateur radio operator was found sitting upright at his equipment, one hand suspended above the straight key, the other on the receiver dial. He seemed lifeless, and failed to react to outside stimuli. While this is a common condition of hams, it was unusual in this case because there was no reaction to a DX call. The diagnosis was "rig-mortis," a catatonic state brought on by continuous exposure to CW. Advanced cases result in complete disorientation, high SWR, and even burned out finals. If you know anyone experiencing these symptoms, please send information to "STIFF," c/o Lishmus General Medical Center, Mount Vernon OH 45323. TNX "GEARVAK Bulletin," Vol. 30, No. 1. 1990.



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MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3 1/2 × 6 1/8 × 7 1/4	6
RS-5L	4	5	3 1/2 × 6 1/8 × 7 1/4	7

#### • 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5 1/4 × 19 × 8 1/4	16
RM-35A	25	35	5 1/4 × 19 × 12 1/2	38
RM-50A	37	50	5 1/4 × 19 × 12 1/2	50
RM-60A	50	55	7 × 19 × 12 1/2	60

#### • Separate Volt and Amp Meters

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12M	9	12	5 1/4 × 19 × 8 1/4	16
RM-35M	25	35	5 1/4 × 19 × 12 1/2	38
RM-50M	37	50	5 1/4 × 19 × 12 1/2	50
RM-60M	50	55	7 × 19 × 12 1/2	60

MODEL	Colors	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	• •	2.5	3	3 × 4 1/4 × 5 3/4	4
RS-4A	• •	3	4	3 3/4 × 6 1/8 × 9	5
RS-5A	• •	4	5	3 1/2 × 6 1/8 × 7 1/4	7
RS-7A	• •	5	7	3 3/4 × 6 1/8 × 9	9
RS-7B	• •	5	7	4 × 7 1/2 × 10 1/4	10
RS-10A	• •	7.5	10	4 × 7 1/2 × 10 1/4	11
RS-12A	• •	9	12	4 1/2 × 8 × 9	13
RS-12B	• •	9	12	4 × 7 1/2 × 10 1/4	13
RS-20A	• •	16	20	5 × 9 × 10 1/2	18
RS-35A	• •	25	35	5 × 11 × 11	27
RS-50A	• •	37	50	6 × 13 3/4 × 11	46

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-12M	9	12	4 1/2 × 8 × 9	13
RS-20M	16	20	5 × 9 × 10 1/2	20
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13 3/4 × 11	46

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	12	4 1/2 × 8 × 9	13
VS-20M	16	20	5 × 9 × 10 1/2	20
VS-35M	25	35	5 × 11 × 11	29
VS-50M	37	50	6 × 13 3/4 × 11	46

#### • Variable rack mount power supplies

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
VRM-35M	25	35	5 1/4 × 19 × 12 1/2	38
VRM-50M	37	50	5 1/4 × 19 × 12 1/2	50

MODEL	Colors	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	• •	5	7	4 × 7 1/2 × 10 1/4	10
RS-10S	• •	7.5	10	4 × 7 1/2 × 10 1/4	12
RS-12S	• •	9	12	4 1/2 × 8 × 9	13
RS-20S	• •	16	20	5 × 9 × 10 1/2	18

\*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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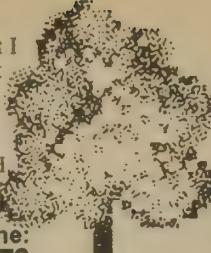
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## the tech side

by Michael Jay Geier KB1UM

### The tools of the trade.

#### Welcome Back!

Welcome to the second installment of "The Tech Side." I'm glad you've decided to check the technical side of the hobby out. I promise you'll learn a lot and have tons of fun doing it! But before you start building or fixing anything, you're going to need some tools. Luckily, everything you need can be found at your local Radio Shack store, so you don't have to go hunting around or mail-ordering to get started.

If you go into the hamshacks of a few technical-type hams, you'll find quite a wide range of tools and test equipment. Some may have a large, expensive array resembling a small research laboratory. Others may only have a few simple pieces of test gear and some basic hand tools. Either can be an effective trouble-shooter and builder, although naturally the more complete setup will allow its owner to do some things not possible with the smaller one.

#### How Much Do I Need?

Well, that's up to you and your wallet. If you're just getting started, I recommend you start small, because you can always grow later. If you buy lots of gear now, you might not make great choices, and you may find the equipment intimidating. Besides, I want you to have some money left over for ham gear. Even if you decide to build some of your station, you probably don't want to try to make your own 2 meter walkie! But then again, maybe you will . . . I'm working on a super-low-cost 2 meter walkie construction project. When it's done, we'll publish it either here in RF or in 73, and I'll bet you will want to build one, even if you already have a fancy commercial unit.

But I digress . . . Let's start deciding what tools to buy to set up shop. The tools used in troubleshooting and building are basically the same, so the choice isn't difficult.

#### Gimme a Hand

Electronics definitely is a hands-on experience, so you will need some basic hand tools. Although some large tools can be handy, you'll spend most of your time working with rather small parts and assemblies, so let's concentrate on small tools for now. Go out and buy these:

A pair of diagonal cutters, needle-nose pliers, a miniature "jeweler's" screwdriver set (be sure you get both flat-head and Phillips head), a few medium-sized screwdrivers, some regular pliers, a small hex key set, and a flashlight. These ought to keep you satisfied for most jobs. Oh, and while you're at it, pick up some TV tuner or contact cleaner, a roll of plastic electrical tape, and a roll of #22 gauge stranded hookup wire.

#### Some Like It Hot

There is one tool you'll wind up spending most of your time with: your soldering iron. Get a decent one; avoid those \$4 "pencil" types. There really isn't much to a soldering iron, but you want to get one with a handle that stays cool (the cheap ones don't) and, naturally, you want the iron to last a long time. Typically, you will fire the iron up at the start of a session and shut it down at the end—it's not like using one of those trigger-operated guns, which are way too big and hot for our purposes anyway. Your iron may stay on for eight or ten hours at a clip. Time really flies when you work on electronics, and it's easy to get so engrossed that you don't even

notice that the sun has gone down (or risen!).

#### Watt's What

Soldering irons are rated in terms of how much electricity they use (in watts), because that's proportional to how much heat they put out. Get an iron in the 30 to 50 watt range. Lower than that, and you may have trouble getting some connections hot enough. Higher, and you might fry printed circuit traces and small components.

Many irons offer the option of affixing different tips. Get a medium or medium-small one. The larger tips just won't fit into some of the nooks and crannies you'll be encountering, and the smaller ones don't have enough surface area to transfer the heat required to join larger connections.

If the iron doesn't already come with a stand, get one. It is very bad practice to lay an iron on the table; you'll burn the table and maybe even start a fire! Besides, a hot iron can burn the blazes out of you and free-floating ones tend to roll around and get in your way. Also, get a tip cleaning sponge. Soaked with water, this will let you clean the hot tip in a jiffy, and a clean tip is *essential* to making proper connections.

Expect to pay \$20 to \$40 for a good iron. I know it sounds like a lot for what is basically a heater but, believe me, you'll be glad you got a quality iron.

Hey, don't forget the solder! Your nifty new iron isn't much good without it. Solder is a bit more expensive than it used to be, but the general rule of thumb is still: The more you buy, the cheaper it is per pound. Tiny rolls actually wind up costing you more in the long run because, believe me, you will go through lots of solder. Get at least a 1/2-pound roll. A one-pounder is even better, and will last you at least a year. Naturally, you want to get the kind of solder used for electronics work, which is all Radio Shack and most mail-order outfits carry anyway. (There are other kinds, such as plumbing solder, and you must *never* use them, because they are corrosive and will ruin your circuits.) Solder comes in various diameters; 0.032" is about right.

#### Getting Testy

Whether you build, repair, or both, you need some way to see what is happening in whatever circuit you are fiddling with. Unfortunately, electrons are invisible, so you need an instrument of some kind which can measure the circuit's voltage, current or resistance. There are two basic kinds: fast and slow. The champion of fast instruments is the oscilloscope, which basically is a fast electronic graphing machine. Although its principles of operation are simple, actually using one takes some practice and a level of understanding you may not yet have.

Another example of a fast instrument is the frequency counter, whose name is pretty self-explanatory. Want to know if your rig is on frequency? Just transmit near the counter's probe and you'll see the frequency displayed in common numbers. The counter has other uses, one of which is very valuable: To tell if an oscillator is functioning at all when there is no oscilloscope handy, or when the oscillator's frequency is too high for the scope to detect.

Slow instruments generally fall into two categories: analog and digital. The most common analog slow instrument is the VOM, or Volt-Ohm-Milliammeter. This very useful box can read AC and DC volts, ohms (usually out to about 1 million ohms or so), and amps (current). Typically, the current range is limited to less than one amp, but some meters can read as high as 10 amps, which is a lot. Most circuits you work on will draw perhaps a few

Radio Fun

hundred milliamps (thousandths of an amp). Actually, the most common use for a VOM is to read voltage; next is resistance (ohms). Current comes in a distant third, primarily because taking a current reading involves breaking a circuit connection, which often may be difficult or impossible in a given circuit.

Digital VOMs, or DVMs (digital volt meters), do essentially the same thing as the analog variety, but have a numeric readout instead of a meter needle. Although they once were quite expensive and exotic, DVMs have become so common that they now cost about the same as VOMs. The principle advantage the DVM offers over the VOM is its precision and accuracy. Even a cheap DVM tells the truth better than any VOM. So why would you possibly want a VOM? Well, it, too, has advantages. The biggest one is that slowly changing readings are shown as a moving or wavering needle. With time, you can get very good at interpreting that waver, and it can reveal all kinds of things. With a DVM, a slowly changing input is shown merely as a moving series of numbers, which is hard to analyze by eye. Also, DVMs sample at discrete intervals, and you may miss something between samples. There are DVMs which have a multi-segment bar graph in the display to show changing signals, but even they don't compare to true analog meters.

#### Meter Halfway

Which should you get? Both. Buy a decent VOM, but don't get a real expensive one. About \$30-\$40 should do it. Then get a DVM for under \$50. Radio Shack has one for \$37 (catalog number 22-188) that should do just fine. If you can't afford both, and your primary use for it will be trouble-shooting, go with the VOM first and save to get the DVM later. Most of the time, the improved graphic display of the analog meter is more valuable than the increased accuracy of the DVM. If you intend to do much home-brewing, though, you may find the DVM more useful, because you can calibrate voltages a lot more accurately with it.

#### Supply Side Electronics

OK, you've got your basic tools. Now, if you have any money left, you might want to stock up on some basic components. Keeping a stock of parts is more important if you plan to home-brew, and not just repair, gear, but it can be handy in repairs, too. There are literally thousands of types of electronic components, so there's no way you can have even a representative sampling of all the different kinds. Some parts, however, are very commonly used, and also find their way into lots of construction projects. Here are some you might want to get:

**Resistors:** Get a supply of common 1/4 watt, 5 percent tolerance resistors. These are the normal kind with four color bands on them. The last band is gold, which specifies the 5 percent tolerance. That means that the true value of the resistor is within 5 percent of the stated value. Radio Shack has an assortment of them in a bag, catalog number 271-308. At \$2.99, you can't go wrong.

**Capacitors:** There are so many kinds of capacitors that you really can only have a small sampling. The "picofarad pack," Radio Shack catalog number 272-806, is nice if you're planning to build any RF circuitry. If not, don't bother with it. For repairs, you're better off buying capacitors as you need them because you'll find you never have on hand the one you need anyway.

**Transistors:** Get some 2N2222 (or PN2222) transistors; and some 2N3904 and 2N3906 transistors, also. These transistors find their way into just about everything and can also be used to replace some other parts which have different numbers. Radio Shack used to carry assortments of them at about 15 for \$2, but I don't see them in the latest catalog. They still sell the 2222s in singles, though. Note that the 2N4401 is essentially the same as the 2N3904.

We'll continue this next time, and we'll also look at how to solder correctly. Till then, 73 from KB1UM.

RF

You may write Michael Geier KB1UM in care of 73 Magazine, Forest Rd., Hancock NH 03449.

## The Care and Feeding of Your Pet Ham

*The pet ham is one of the most intelligent of pets, often seeming almost human. The following is a short guide to some of the most important things you should know about in caring for your pet ham.*

**Living Area:** Your pet ham should have a private area of its own where it will not be disturbed. It will spend many happy hours alone there with its collection of treasures (boxes, wires, bits of metal, glass, paper, plastic, etc.). It should be encouraged to confine

its activities to this nest room to protect the rest of the house from its natural tendencies toward noise, clutter, and making holes in the walls.

**Expenses:** Raising your pet ham can be an expensive hobby. However, unlike most pets, the pet ham can be trained to work outside the home for short periods of time and bring in enough money to cover part or all of its expenses.

**Feeding:** The well-behaved pet ham will be able to eat with the family on occasion, but it feels more comfortable and secure taking many of its meals in the privacy of its nest room.

**Housekeeping:** Pet hams can be trained to use the family bathroom facilities, but it may be difficult to train them to pick up after themselves in the kitchen.

**Obedience Training:** Most pet hams can be trained to respond to a few simple commands. The easiest to teach are "sit" and "speak." Once your pet ham has learned these behaviors, it will sometimes practice them on its own for hours at a time.

**Note:** Variations of the above have appeared in many ham newsletters from all over the country at different times. We do not know who the original author is. Do any of you?

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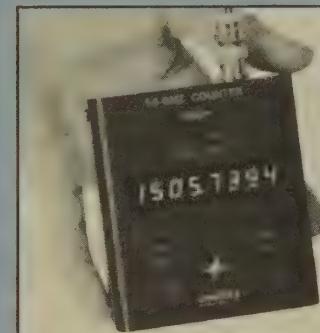
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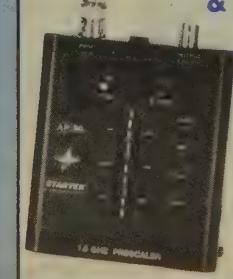
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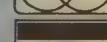
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# RF review

## The OXO Transmitter Kit

by Bill Brown WB8ELK

- In the U.S.: Kanga US c/o Bill Kelsey N8ET, 3521 Spring Lake Dr., Findlay, Ohio 45840.
- In the U.K. or overseas: Kanga Products, 3 Limes Road, Folkestone, Kent CT19 4AU, Great Britain.

Price: \$19.95 + \$3 shipping U.S.

For those of you new to the HF frequencies, let me introduce you to the thrills of QRP (low-power) operation. With just a watt or two of power, you can make some great contacts worldwide if conditions are right. One of the big advantages of running QRP (QRP is generally regarded as using anything less than 5 watts) is that your transmitter is going to be very small and allow you to easily operate with just a small battery. With a companion miniature receiver, you can have a blast operating portable from just about anywhere. (Two good candidates are the Simple SuperRX in the April 1991 issue of 73 and the "Sudden" receiver which will appear in the October 1991 issue of 73).

### The OXO

The OXO transmitter by Kanga Products fits the bill for a very affordable and extremely easy-to-build kit. The original circuit by George Burt GM3OXX appeared in *SPRAT* (The Journal of the G-QRP Club). It was a popular circuit, so with George's kind permission, Kanga Products added it to their line-up of fine QRP kits and accessories.

### Easy Beginner's Kit

The OXO was designed for the beginning kit-builder in mind. Even though the board is reasonably compact, I found it was laid out for very easy assembly. Large solder pads, with parts placed well apart, made this a breeze to put together. No need for a magnifying glass here, as all components have plenty of "breathing room."

The kit comes complete including a crystal for the QRP calling frequency for the band of your choice (160m, 80m, 40m, 30m or 20m). A crystal in the 80m Novice segment is also available.

### Assembly

I found the instructions to be brief but straightforward. The parts placement diagram was easy to follow (once I determined the orientation of the circuit board) and helped make sure I got everything in its correct location.

Only one step takes a bit of patience. The RF choke consists of 30 turns of very fine gauge wire (included in the kit). It takes a while to wind this coil through the hollow core of the ferrite

bead form, but the operation went pretty smoothly (ample wire was supplied).

### Final Test

After assembly, I double-checked everything to make sure I had everything in its proper place (a good idea before you power up any kit!). I mount-

ed the OXO in a small chassis with a key jack, power switch and plug, and antenna connector to complete my super portable transmitter.

Tune-up is ridiculously easy. You basically just apply power and transmit! No adjustments or fussing around

to get this rig going. The output of the OXO should be in the neighborhood of 2 watts, depending on the band of operation you choose.

### On-The-Air!

I started out on the 80 meter QRP frequency of 3.560 MHz. I hooked the OXO up to my 80 meter dipole and tried a few calls. Sure enough, a fellow from Pennsylvania came back and carried on with me for some time. He gave me an RST report of 569 and stated that my signal was nice and stable with a good sound to it. He was pretty amazed when I told him that I was running just 2 watts! It doesn't take a lot of power to communicate when interference and noise are not bad.

I tried a 40 meter crystal in the OXO on the QRP frequency of 7.030 MHz (7.035 and 7.040 MHz are other pop-

time kit builder. I particularly liked the fact that since the OXO requires no tuning, peaking or tweaking, you don't need any fancy test equipment to get it going.

### Kanga Products

Kanga Products carries a fine line-up of innovative QRP kits. Quite a few of these have appeared as construction projects in the pages of *SPRAT* (The G-QRP Journal). Since a number of these projects were originally inspired by G3ROO, the name of Kanga seemed appropriate (ROO is slang for Kangaroo). In Great Britain (as well as overseas), Dick Pascoe G0BPS and partners offer the Kanga line of kits. You can reach him at the address given above. To help distribute the kits in the U.S., Bill Kelsey N8ET has offered to carry the complete Kanga line.

A catalog is available from Bill at the above address. Please enclose an SASE. I think you'll find the catalog offerings very interesting! Micro-miniature transmitters and receivers on 1-inch square circuit boards, mini-SSB transceivers, T/R switching circuits and wattmeter-SWR bridges are just a few of their many projects.

### Clubs and Nets

*SPRAT* is a very informative journal published by Rev. George Dobbs G3RJV for the G-QRP Club. Each issue is packed full of fun QRP projects guaranteed to keep you happily building away at your workbench. Be warned that you'll be so busy building projects that you may not get a chance to actually operate for long stretches at a time. For more information about the G-QRP club and *SPRAT*, write to Rev. George Dobbs G3RJV, St. Aidan's Vicarage, 498 Manchester Rd., Rochdale, Lancs, OL11

3HE, Great Britain. You can subscribe to *SPRAT* and join the G-QRP club in the U.S. by sending \$12/year to Luke Dodds W5HKA, 2852 Oak Forest, Grapevine, TX 76051.

Another QRP group you may want to join is the QRP Amateur Radio Club, International (often referred to as ARCI). They put out a fine magazine called *QRP Quarterly* which is also packed full of great projects. Dues and subscription is \$12/yr; available from Mike Kilgore KG5F, 2046 Ash Hill Rd., Carrollton TX 75007.

The Michigan QRP club is another source of information about low power operation. Membership in their group is \$7/yr. Contact them at P.O. Box 80804, Lansing MI 48908-0804.

I think you'll enjoy your first time operating with QRP power. The most common QRP calling frequencies are 3.560, 7.030, 7.040, 14.060, 21.060 and 28.060 MHz. You'll almost always find some QRP activity in the evenings on both 3.560 and 7.030, or 7.040 MHz. There are even some QRP nets that operate periodically. One of these is the Monday evening Northwest QRP net from Washington state. Look for them around 0400 UTC (9 p.m. PDT) on 7.040 MHz.

## KANGA PRODUCTS

### THE \*OXO\* TRANSMITTER

Designed by George Burt GM3OXX for the G-QRP Club, the OXO is a small Transmitter that can be either crystal or VFO controlled.

### One Jump Ahead

Photo A. The OXO QRP transmitter kit.



Photo B. (L to r): Kanga U.S. rep. Bill Kelsey N8ET, George Dobbs G3RJV (editor of SPRAT), and Dick Pascoe G0BPS (Kanga U.K.) look over some of the latest circuits.

ular QRP frequencies). Once again, I made a number of enjoyable contacts and really had no problem maintaining contact even during fading.

Antenna switching required me to either use an antenna coax switch or quickly transfer the coax from my receiver and hook it up to the OXO each time I transmitted.

Fortunately, Kanga Products offers a T/R (Transmit/Receive) relay kit to solve this problem. If you aren't using an antenna tuner between your OXO and the antenna, you might need the optional low-pass filter board to cut down harmonics. The \$9.95 filter board is very compact and easy to assemble. It can be used with any QRP transmitter.

### Impressions

I definitely had fun putting together my OXO. It's a great evening or weekend project which will produce reliable results the first time you power it up. This is the perfect kit for a first-



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While these products' advanced features satisfy the most experienced operator, self-explanatory menus, online help, a superb manual, & telephone support let the beginner master the basic functions quickly.

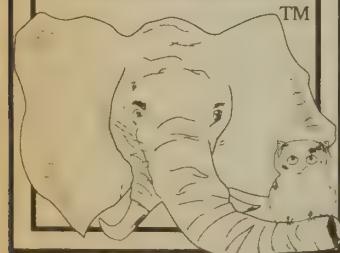
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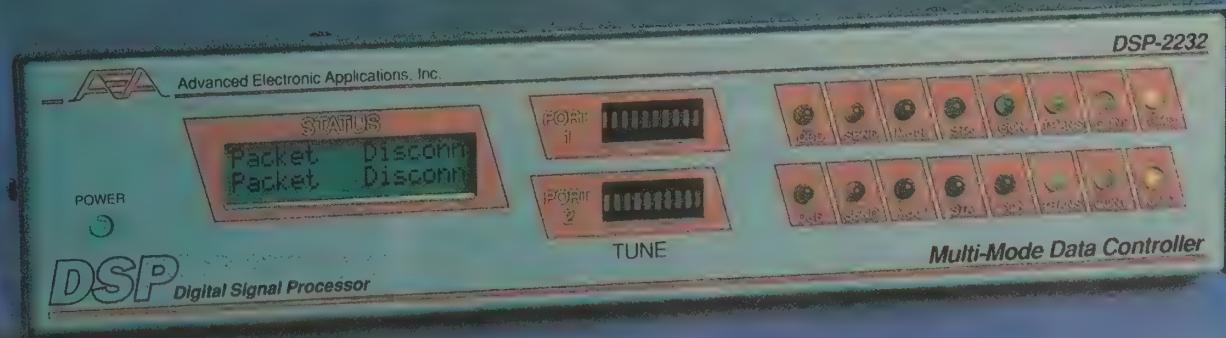
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## what next?

by Carole Perry WB2MGP

### Kids Having Radiofun

Having fun in any hobby can only enhance your fulfillment and make you want to get more involved. Amateur radio offers so many opportunities for enjoyment and satisfaction that half the fun is in exploring all the possibilities. Don't be afraid to take a risk and try something new. As a newcomer to the hobby, you should make it a point to keep an open mind at all times. The more you experience and participate, the more you will begin to see why all the rest of us are so "hooked" on the adventure of ham radio.

As a teacher of teenagers, one of my greatest pleasures is helping youngsters get started in ham radio and then watching them take off in their own directions with a style all their own. The following stories feature youngsters who are having fun, learning new things, and meeting all kinds of interesting people since they got licensed. If you know of any youngsters, oldsters, or anyone in between who wants to share his or her exciting radio experiences with the rest of us, please write to me in care of this column, and let's spread the good ideas around.

Lee Kissel WA2JWR is an active ham in Staten Island, New York. It's not a surprise to learn that Lee's dad is Walter KA2YBR and his wife is Donna WA2JWQ. It's especially nice,

however, to know that his 13-year-old son is Walter KB2IOZ.

#### Walter Kissel KB2IOZ

I first met this charming young man when he accompanied his dad to local

the world. Walter recalled two of his memorable contacts for me. Even though he has since made several contacts with different countries in Africa, he easily remembers how excited he was with his very first contact in



Photo A. Walter Kissel KB2IOZ at the mike. His growing collection of QSL cards is on the wall to his left of his station (not shown in the photo).

club meetings. When Walter was only 11 years old and in the 6th grade, he got his ham radio license. I really loved the fact that Walter was always encouraging other children not to give up if they failed the license exam the first time.

Walter doesn't have to fight off the rest of the family to get to the radio. He has his own 10 meter rig, a Uniden HR-2600 with a Cushcraft AR-10 vertical antenna. He always loved visiting his dad's ham shack and listening in on the low bands. Working DX remains one of his favorite activities. He loves speaking with people all over

Tanzania with Thomas 5H3TW. His enthusiasm was obvious to me as he relayed the details of his contact with a ham named Zedan JY3ZH from the country of Jordan.

Two exciting experiences that Walter would like to share with others were his participation last year in the New Jersey Liberty Park Marathon, where he helped his club provide communications, and his help with the Bayonne Emergency Management Amateur Radio Club in doing an ATV (Amateur Television) demonstration at Intermediate School 72 in Staten Island. The Kissel family recently made

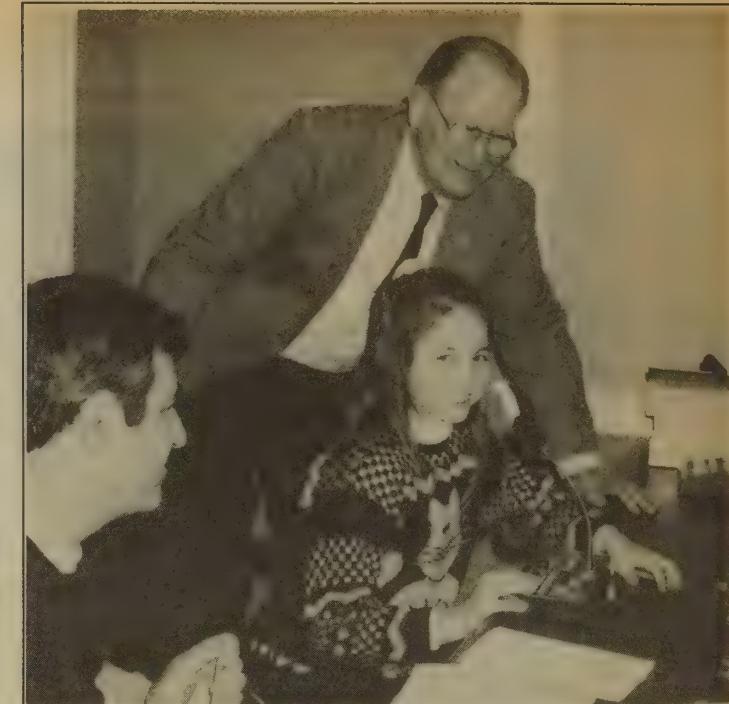


Photo B. At W1AW, left to right: Burt K1OIK, Samantha KA1VBQ, KA1VBQ, and Chuck May K1MAV, who tested Samantha on the Cape.

good use of their radios on a trip to South Carolina and a vacation to Toronto, Canada. Walter had a terrific time making contacts on his 440 and 2 meter rigs. He encourages all new hams to help their family members get involved with them and join in the fun.

#### Samantha Fisher KA1VBQ

Samantha is a charming nine-year-old who passed her Novice exam when she was eight, and her Technician exam this year. She has worked 20 plus countries and operated W1AW for 90 minutes, handling quite a pile-up. Her dad, Burt K1OIK, tells me that, coincidentally, the person who corrected her Tech exam on Cape Cod just happened to be at W1AW when Samantha operated the ARRL station.

Among her achievements is a two-hour QSO with the Azores, in which she and a 10-year-old friend and her family talked in Portuguese to friends in the "home country." She also operated from the South Yarmouth Radio Shack during Ham Radio Day last fall.

Samantha tells me that she got interested in ham radio by hanging around her dad's shack and seeing how much fun he and his friends were having. She got on the mike as a little girl from time to time and really got caught up

in it. She loves to meet new people on the air, and has a special memory of a wonderful contact she made with a ham in Florida recently. They spoke for more than 30 minutes about everything from air-conditioning to tourist attractions to the weather. She enjoyed the idea of an adult taking so much time to speak with her on the radio.

Needless to say, Samantha and her dad take their rigs on vacation with them. She recalled how she was able to contact Burt while he was at a meeting at a convention while she remained at the pool. Like so many ham families, the Fishers are enjoying the convenience and fun of being able to stay in touch with each other when they get separated while on a trip.

When I asked Samantha what advice she would give to youngsters who are first getting into the hobby, she said, "Try to get your friends interested also, so you can have kids your own age with similar interests to talk to and plan things with."

If any of you have "beginning in ham radio" stories you'd like to share, please write me at the address below!

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Radio Fun



# radio magic

by Michael Bryce WB8VGE

There is one mystery no one has ever solved—what is the best radio for a newcomer to the hobby to get? Pick up a magazine. Thumb through it. Ah yes, those slick color pages just make you want to jump up and buy. You're totally surrounded by specifications, features, and possibilities!

The cost of starting in any new hobby can vary. Most importantly, cost can determine if you stay with a new hobby. No one that I know of likes the idea of shelling out lots and lots of money on something they aren't sure about.

But there is another way to look at this. My favorite example is bass fishing. You can get a pole, some fishing line, sinkers and a tin of worms. Wade out in the water and have one heck of a good time. Minimum money spent with maximum fun output! On the other hand, you could spend lots of money on the best computer controlled fishing pole. Electronic fish finders, bass boat, boat trailer, and of course, a 4x4 truck to haul the entire load to the lake in.

Now, the guy with the boat might hook bigger fish than you, the guy with

the pole, but will he have more fun? And will the guy with all the fancy gear necessarily hook bigger fish? Maybe, maybe not. As the old saying goes, "All fishermen are liars except you and me, and I'm not sure about you."

## What Really Counts

What does this have to do with ham radio? Plenty. It's not how much money you spend, but the FUN you get for your money. I don't know about you, but I don't like to do anything unless it's FUN.

Since money is often tight when you start a new hobby, let's take a look at some of the used gear you might find at a

hamfest or store. What kind of used radios are out there? While this should not be taken as the last word on radio buying, it should give you a good idea of what to look for around the hamfest's flea markets.

Before the new codeless ticket became fact, the newcomer to ham radio was more or less forced to a CW-only transmitter or transceiver. That thinking just doesn't cut it anymore. When

the guy with the boat might



Photo A. Old and heavy, but still able to produce a signal you'll be proud of.

looking for a used rig, go for SSB as well as a radio with good CW features.

There are several "got's to do" before starting out. First, you'll need to have a budget. Just how much money are you willing to spend? Do you have the skills needed to fix a broken radio? Do you have a certain name brand in mind? How about band coverage? The radios without the WARC bands (that's 30, 18 and 12 meters) can sometimes be cheaper to pick up than those that cover all the bands. How about any special features, such as fast QSK (full break-in) for AMTOR or packet? A separate receiver and transmitter usually cost less, but can sometimes be harder for the new ham to work than a transceiver. And what about the age of the gear?

## Oldies but Goodies

Some of the older gear from the '50s and '60s are real workhorses—and weigh about as much. They're big and heavy and require a lot of juice to operate. Names like Hallicrafters, Collins, and Hammarlund were the big ones. Some of the smaller guys had names like Harvey Wells Band Master and Johnson Radio. Most of the rigs from the '50s did not work on SSB (it wasn't out at the time), but they all do a good job on CW. Some will operate AM if the mood strikes your fancy. Yes, some AM is still used on the ham bands; not much, but it's out there.

From the late '60s to the '70s, the radio gear changed dramatically. The

transistor was beginning to show up in receivers. Some manufacturers began using transistors in the early stages of the transmitter with a tube final (sometimes with more than one tube) to provide most of the power to the antenna. This is known as a hybrid design. It uses the best of both worlds: The transistor in the low power stages in both the receiver and transmitter, with tubes in the higher power stages of the transmitter.

By the middle of the '60s, SSB was becoming standard, with AM transmit slowly going by the wayside.

In the latter part of the '70s, the transistor final became standard. Transistor finals can produce 200 watts of input power with no trouble.

Names like Drake, Ten-Tec, and Yaesu share in the spotlight along with Hallicrafters and Collins. Heathkit had a strong line of kits for the hams. Sadly, Heath dropped their entire line of ham radio equipment this year. Some of the most popular models were the DX-100 and the newer HW series. The



Photo B. Hallicrafters receivers and transmitters with a Johnson Viking VFO comprise this setup.

Heath HW-101 can still be heard on the air today. They're not very expensive to pick up, and you can fix 'em if they're broke.

## New Technology

By the end of the decade, most of

the tubes inside of our radios disappeared, giving way to 100 percent solid state. The transceivers were also becoming much more complex. Multiple VFOs and digital readouts were jammed into little boxes. Kenwood and ICOM were becoming very popular with hams. Especially Kenwood's TS-520.

With the invention of the microprocessor, ham radio really got a boost. By the middle of the '80s, microprocessor controlled radios started to show up everywhere, from hand-held 2 meter handie-talkies to full blown HF transceivers.

Along with the microprocessors, surface mount technology (connecting components directly to foil patterns without using holes) has made repair of these marvels almost impossible for the average ham.

Who's left? ICOM, Kenwood, Yaesu, and the only American company still making amateur gear, Ten-Tec. Hammarlund is no more, and Collins went to military and government contracts. Hallicrafters tried one more time with their FPM-300 series to compete against the imports—and lost. Drake came out with their all solid state radios, TR-7 and TR-5. Lack of sales forced Drake out of the ham business and into other fields. (On a good note, earlier this year, Drake came back with their R-8 shortwave receiver.) Of course, there are dozen of names that have come and gone over the decades. Some you'll find in the hamfest, some only in memories.

Next time we'll look at some of the specifications you should be able to understand so that you can solve some of the mysteries of buying a used ham transceiver.

RF

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# A Place to Put It All

## Build this custom desk for your new station.

by Stephen W. Gibson WB4NBI

If you have spent most of your funds on your rig and the accessories, and need something to put it all on, this desk may be the answer to your problem. With a little support, you can begin your chase for a spot on the DX Honor Roll.

Designed to be made from standard-size, off-the-shelf lumber, it requires a minimum of sawing—and absolutely no soldering! For the necessary sawing, an ordinary hand saw is sufficient. You can drill the holes for the screws that hold it all together with the common 1/4" drill found in almost every toolbox.

desk surface to give me sufficient room to operate the key under the shelf. It also gives me space to keep my log and a calendar for skeds.

The top shelf, 7" up from the first shelf, takes my Argosy transceiver and power supply with ease. If you have several rigs to accommodate—lucky you!—you can put the power supplies on the lower shelf, against the floor braces.

### Construction

When you have decided on the dimensions most suitable for you, cut the lumber to fit. For my desk, I got

will help the joints. You can apply glue to every mating surface before putting the screws in. Countersink the screw holes and, after the final tightening, fill them with plastic wood. If you don't have a countersink, you can use pan-head screws.

All of the corners and edges should be rounded slightly with sandpaper. Fine grade will do. Give the desk top special attention so that it will be as smooth as possible. A final sanding with extra-fine sandpaper will finish the job.

Last, you can paint the desk in the color of your choice. Or you can stain

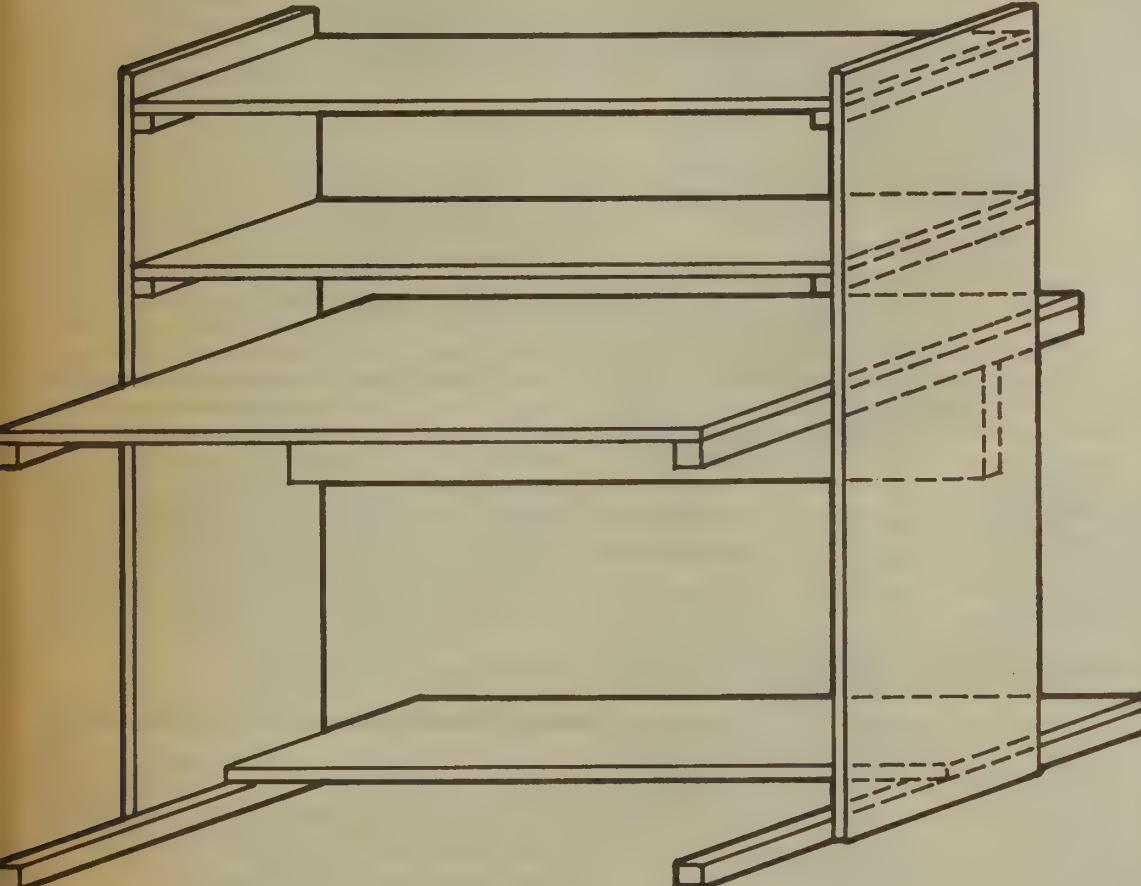


Figure. This drawing can give you a good idea of what the finished desk looks like.

The sides and shelves are 1" x 12" shelf lumber, while the operating surface is a piece of 3/4" plywood measuring 24" x 48". You can get plywood in this size at most lumber yards in this area, and, I presume, in the rest of the country. The shelf supports and the braces at the bottom of the sides are made from 1" x 2" lumber. If the 48" width is too wide for the space available in your shack, the desk surface and the shelves can be cut to fit whatever space you have.

The distance from the surface of the desk to the floor, and the spacing between the shelves, can be varied. For me, 27" from the surface of the desk to the floor is just right, but if you are taller or shorter, you can adjust the distance to fit. Use the height of a table or desk you're comfortable at.

one 8-foot-long piece of 1" x 12" lumber and sawed it in half to make the sides. Then I got two more pieces of lumber the same size, and cut them in half for the shelves and the desk top support.

The 1" x 2" supports for the shelves were cut to the same size as the shelves and the sides, probably about 11-1/2", while the supports for the desk top and the floor braces were cut to 24".

The only cutting that's not straightforward involves the notches. You will have to cut them at each end of the 1" x 12" desk top support to fit around the 1" x 2" desk top side supports for a snug fit.

You might want to put a length of 1" x 2" on the back edge of the desk top so that your pencils, papers, or key cannot slip off.

To put the operating desk together, use #8 x 1" wood screws. I spaced mine about 4" apart at every joint. Glue

it, or use one of the stain/polyurethane combinations to make it attractive.

### Cost and Materials

In the fall of 1990, in the Washington DC area, knot-free Douglas fir was the most expensive wood available. Making the desk out of it would have cost about \$85, including the screws. Laminated pine, made of 1" x 2" strips glued together under pressure, lowered the cost to \$62. Plain shelf lumber, laughingly called "knotty pine," was \$48. You have to be very careful if you select lumber in this cheapest grade, of course. In particular, look out for warped boards, and boards with large knots and rough areas. The finish will add another five or ten dollars, depending on what you get, to the total cost.

RF

I positioned the first shelf 4" from the



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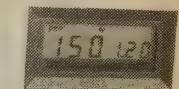
### Cross Needle SWR/Power Meters for All Bands



CN-101

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-101	1.8-150 mHz	15/150 W/1.5kW	SO-239
CN-103	140-525 mHz	20/200 W	SO-239 or N
NS-660A/PA	1.8-150 mHz	30/300 W/3kW	SO-239
NS-663BM/BN	140-525 mHz	30/300 W	SO-239 or N type

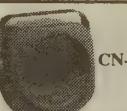
### Digital SWR/Power Meters for All Bands



DP-830

Model	Freq. Range Int. Sensor	Forward Power	Connectors
DP-810	1.8-525 mHz	0-1.5 kW/0-15W	SO-239 or N type
DP-830	1.8-150 mHz	0-1.5 kW	SO-239
DP-820	140-525 mHz	0-150 W	SO-239 or N type

### Mobile/Base Cross Needle SWR/Power Meters



CN-410M

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-520	1.8-60 mHz	200/2000W	SO-239
CN-410M	3.5-150 mHz	15/150 W	SO-239
CN-460M	140-450 mHz	15/150 W	SO-239
CN-465M	140-450 mHz	15/75 W	SO-239

### Coaxial Switches

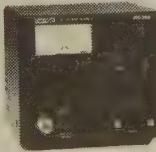
CS-201	CS-201GII	CS-401	CS-401G
2 Position	2 Position	4 Position	4 Position
Frequency: 500mHz	1.3 GHz	800 mHz	800 mHz
Connectors: SO-239	N type	SO-239	N type
Isolation: +60 dB	+60 dB	+50 dB	+50 dB
Power Rating: 2.5 kW PEP	2.5kW PEP	2.5 kW PEP	2.5 kW PEP
1 kW CW	1 kW CW	1kW CW	1 kW CW

CS-201

CS-401

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PS-304



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Voltage	3-15	13.8	1-15	1-15	1-15
Current(ICS)	12A	14A	30A	33A	40A
Current(Cont.)	9.2A	12A	24A	30A	32A
Ripple(Max)	3mV	3mV	3mV	3mV	3mV
Regulation	1%	1%	1%	1%	1%
Cooling Fan	NO	NO	NO	YES	YES
Size(inches)	5x4x9	5x4x9	7x6x9	7x6x9.5	11x5.5x9
Weight(lbs.)	11	11	16	21	22

NEVADA

WB1300

Receive:

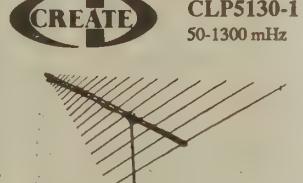
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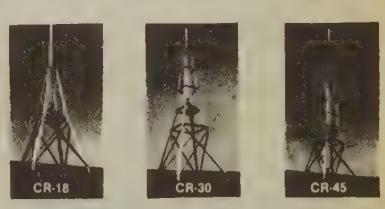


CLP5130-1  
50-1300 mHz

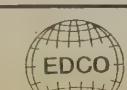
This high gain, wide-band VHF/UHF antenna is excellent for DXing, amateur radio, FM broadcast, scanners, VHF/UHF television, government, cellular and business band use. The forward gain is 10-12 dB, front to back ratio 15 dB, 23 elements, transmit power to 500 watts. Boom length 5.8ft., VSWR 2.0:1 or less, max. Longest element 9.8ft., weight 11 lbs. wind survival 90 mph. CLP5130-2, 105-1300 mHz also available. 19 Element Boom 4.6 ft. Element 4.6 ft.

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Model	Height	Base Width	Max. Wind Load Ft <sup>2</sup>	Max. Vert. Load Lbs.	Weight
CR18	5'10"	31 1/2"	21 @ 90 mph	440	18
CR30	9'10"	39"	27 @ 90 mph	1,322	33
CR45	14'9"	39"	23 @ 90 mph	881	57



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# A Buyer's and Repair Guide to Flea Market Bargain

## Buy a rig for \$50 or less!

by Joel J. Levine WB2BMH

Every time I go to a hamfest I hear the same complaint from the old-timers. It goes something like this: "When I got started in this hobby, I bought my first rig with spending money from

(fill in the blank with 'paper route,' 'allowance,' or 'bottle returns') and now the cheapest rigs cost \$1,000."

Usually I break in and tell the guys that used rigs have never been cheaper in relation to income than they are today, and give a few examples. Everybody nods in agreement, and then the topic changes to Yaesu, Kenwood, ICOM, or another of today's high-priced goodies.

I own an ICOM 730. It's a very nice unit, and I'm not knocking modern equipment; but if you are on a limited budget, or if you are like me and want a little challenge but don't have the skill or money to home-brew, you could consider some of the older SSB transceivers built in the 1960s.

The good news is that there are many bargains available at flea markets for \$50 or less. That's right—a complete SSB transceiver with good sensitivity, excellent selectivity, and an on-the-air signal which cannot be distinguished from today's highest-priced equip-

ment. The bad news is that some of this equipment needs work: usually, but not always, new tubes and alignment. If you want to be an appliance operator, this game is not for you because most of the manufacturers are out of business. If you do not do it yourself, repair service can be hard to find and expensive.

Believe it or not, in the last two years my dad, W2RKC, and I have bought seven



Photo A. Eico 753.

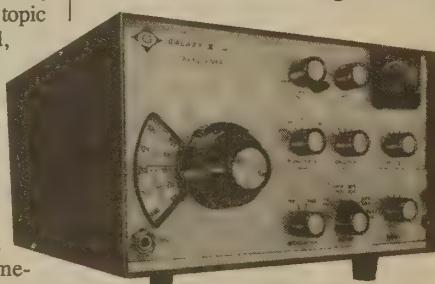


Photo B. Galaxy V.

transceivers with AC or AC and DC power supplies for less than \$30 each, and put them on the air for less than \$15 in parts each. And we did not buy every "bargain" we saw. This isn't a story about the guy who bought (stole?) a mint KWM-2 from a widow for \$50.

These are standard flea market items readily available if you know what to look for and have the patience to wait and find it.

I am going to share our secrets with you and tell you which models to look for and how to determine if the equipment is a good buy, and give you some pointers in basic servicing.

### What to Buy

The rigs we look for are the early SSB transceivers from Swan, National, Hallicrafters, Heath, SBE and Galaxy. These complete ham rigs have crystal or mechanical filters, providing receiver performance comparable to modern equipment, and transmitters delivering 150 to 200 watts PEP input or more. Unlike the rigs of today, these early economy jobs were quite different from each other. Some were made from kits, most are single band or triband units, and some but not all have provisions for CW.

Mechanically and electrically, they are different from a modern rig. Most are tube jobs (a few transistors pop up in the VFO and audio circuits) with mechanical dials and frequency cali-

bration in 5 kHz increments. Integrated circuits were not yet in consumer products, so the circuits are very straightforward. Some of the chassis have printed circuit boards, but most are point-to-point wiring. These units are surprisingly compact with typical dimensions of 5" H x 15" W x 12" D.

The tribanders covered 20, 40 and 75/80, and the five-banders also covered 10 and 15 meters. Some of the five-banders have only a limited portion of 10 meters.

Table 1 lists some of the models which may be available for \$50 or less.

### How to Buy It

Asking the current owner for a report on the condition of the rig is not a reliable way to select your unit. Some sellers are disposing of equipment for someone else and do not know firsthand the condition of the rig. Others have not tried their unit in years. And, unfortunately, a few scoundrels lie.

in the power supply have been changed. This is a common minor repair. Look for signs of rust on the chassis. Some slight discoloration is acceptable, but you do not want a rig that looks like it was salvaged from the wreck of the *Andrea Doria*. Turn the dials and controls. They should move freely and easily.

Ask about spare tubes and manuals. If the manual is not available, think twice about the purchase since a replacement, if you can find one, may be costly. (Several vendors advertise replacement manuals in the classified ad section of ham magazines.) Also ask about a microphone. If none comes with the unit, check the seller's table. Microphones are bountiful in flea markets, and several times I have convinced sellers to throw in a mike. If no mike is provided, make certain

that you have a mike plug compatible with your unit. If not, the flea market is the place to pick one up.

Look at the power supply and determine if it is the same make as the transceiver. If it is not, it will probably work, but you may have to tinker to get the correct bias voltage.

If the power supply is home-brew, be prepared to purchase another power supply. I have seen homemade units with very unsatisfactory regulation and voltage readings.

How much should it cost? That's between you and the seller. I have seen most of the units listed in Table 1 sell for less than \$50 in flea markets in New York, New Jersey and Florida. I have also seen many of these units with asking prices far in excess of \$50, and sometimes as high as several hundred dollars. The seller has the right to ask any price, and the buyer has the right to counteroffer or decline to purchase. Last year I was offered an SBE-33 for \$125 and I declined. A few weeks later I bought one for \$15. Due to limited availability in your part of the country, you may have to pay more.



Photo C. Hallicrafters SR-150.

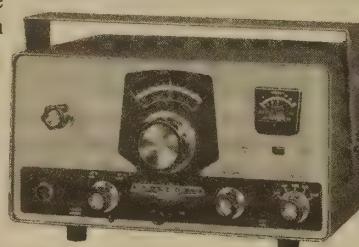


Photo D. Heathkit HW12, 22 or 23.

parts missing. If electricity is available, plug it in and listen for a receiver signal. If you have a dummy load, bring it with you to the flea market and park it in your car until needed. If no power is available, carry a screwdriver and ask permission to remove the cover. Look for signs of tampering, such as missing parts. Do not be overly concerned if the capacitors or rectifiers

Table 1. Common Models for \$50 or Less.

Manufacturer and Model	Bands	CW	VOX	Comments
EICO				
753	3	Y	Y	Nicknamed "Seven Drifty Three."
GALAXY				
III	3	Y	Y	Nice dual vernier dial.
V	5	Y	Y	Same as III but five bands.
HALICRAFTERS				
SR150	5	Y	Y	Receiver offset tuning.
SR160	3	Y	Y	Receiver offset tuning.
SR500	3	Y	Y	Same as SR160 except 500W PEP.
HEATHKIT				
HW12, HW12A	20 M	N	Y	"A" models have upper and lower SSB.
HW22, HW22A	40 M	N	Y	
HW32, HW32A	75 M	N	Y	
NATIONAL				
NCX-3	3	Y	Y	AM capability (SSB with carrier inserted).
NCL-200	5	Y	Y	
SBE				
33	80, 40, 20, 15	Y	Y	Transistorized except final amp. AC and DC supplies built in. 135W PEP.
SONAR	1	Y	Y	Separate models for 10-15-20-40-80. 200 or 400 Hz coverage per band.
SWAN				
120	20 M	N	N	120W PEP.
140	40 M	N	N	120W PEP.
180	80 M	N	N	120W PEP.
240	3	Y	N	
350	5	Y	N	400W PEP, dual vernier dial, VOX option.
260 (Cygnet)	5	Y	N	Built-in AC and DC supplies.

Notes: 1. Three-band units cover 20, 40 and 75/80 meter bands. Five-band units also cover 10 and 15 meters. Some units cover only part of the 10 meter band. 2. All transmitters are 150 to 240 watts PEP input unless otherwise indicated. 3. All units were made between 1962 and 1969. 4. Other transceivers made during this period, but generally not available within the price range described: Collins KWM-2, Drake TR3, TR4, Hallicrafters SR400 and SR2000, National NCX-5, SBE 34, Heath HW100 and SB100. Some of these units sell for \$100 to \$200 and also represent an excellent value.

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While you are still at the flea market, you may want to pick up spare tubes at flea market prices. Commercial tube dealers charge outrageous prices these days.

#### How To Fix It

If you were able to plug the unit in at the flea market, you are way

ahead at this point. If you're already home with the unit, I recommend that you go slowly. Remove all the tubes, plug in the unit, and turn it on. Sniff for overheating or burning parts. If it passes the sniff test, check voltage readings off the socket which connects the power supply and transceiver. Be careful of the B+ on the finals, which will be close to 1,000 volts. As soon as the unit is turned off, bleed the B+ by shorting the final amplifier plate cap to ground.

If the voltage readings appear normal, insert all the tubes except the final amplifier tubes, then turn the unit on. Do your testing on 75 meters, since marginal circuits will work better at a lower frequency. At this point you should have normal receiver function. If not, look for easy-to-repair problems. Try headphones, for example. A ham once sold me a Yaesu FT-101 which "needs an alignment or something." When I took it home, I discovered that the internal speaker was bad. I plugged in an external speaker, and put the rig on the air.

If there are problems, check the tubes. The best way is by substituting with known tubes. If you do not have a set of tubes, find a ham with a good mutual-conductance tube tester.

Once you have the receiver working, plug in the final tubes. Remember to shut off the power and bleed the power supply. Turn the rig on and follow the manufacturer's directions for setting the bias. If you do not have a manual, a good rule of thumb is 20 mA of current for each final amplifier tube.

If the unit transmits but does not modulate, check the mike cable. Some units use the same type plug with a different pin setup, so be sure to check the hookup as described in the manual. Often mike cables fray from normal use, and the wires break internally, so check the mike cable for continuity. Repeat power output tests on the highest frequency in the unit. Weak amplifier tubes may have full output on 75 meters, but practically nothing on 10 meters. Even new tubes typically output one-third less power on 10 meters than on 75 meters.

Another consideration is the quality of the electrical and mechanical connections. This is particularly troublesome in kit units because of the variable quality of the solder joints. When a kit gives me trouble, I resol-

der all the connections by removing any excess solder that caused improper cooling and unpredictable electrical contact, then I reheat all the points until the solder flows smoothly around the connection. I bought an HW-100 several years ago from a frustrated kit builder who completed the unit, meticulously retraced the placement of each part, and still could not get the box working. I resoldered everything in sight and had the HW aligned in 30 minutes.

Switches and relays can be problematic. An intermittent transmitter or receiver is often caused by dirty relay contacts. Band switches with multi-part wafers can also absorb insulating grime. It probably pays to spray clean all mechanical switches at the first sign of trouble. If the unit works on one band but not another, you can reasonably expect to find a



Photo E. National 200.

Table 2. Ten Common Problems and Solutions.

Problem	Possible Cause	Solution
1. No function, no filament voltage.	Power supply	Check fuses, switches, cables, power cord.
2. No function, filaments light.	Power supply	Power supply rectifier diodes.
3. Receives but does not transmit.	No high voltage or bad driver, final tubes	Check high voltage output and driver and final tubes.
4. Receiver is distorted.	Power supply or audio circuit	Bad filters in power supply or bad audio tube.
5. Receiver OK, transmitter distorted.	Incorrect bias voltage	Check bias setting.
6. Receiver OK, no or low transmitter output.	Driver or final tubes	Replace bad tubes.
7. Does not work on one band.	No converter signal	Check converter crystal, and clean band switches.
8. Intermittent transmitter or receiver	Bad electrical contact	Clean relays and switches, resolder joints.
9. Transmitter power output but no modulation.	Microphone	Check microphone and mike wiring.
10. Receives all bands but power output low on high frequency.	Driver or final tubes	Replace tubes.

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defective converter crystal for that band, or a dirty band switch.

Most of the time these steps will get an old unit back on the air. If the unit

#### The Unthinkable

I have two reassuring thoughts for those of you who fear that you may ultimately fail in your efforts to repair your flea market bargain. First, if you follow the steps I have outlined here, and use a little electronic detective work, you most likely will get the rig back on the air. Second, if you finally give up, nothing is lost, because you just take it back to the flea market next year, get a tail-gating space, and post a big sign that reads: AS-IS: SSB RIG, PRICE NEGOTIABLE. RF

Contact Joel J. Levine WB2BMH at 38 Bamboo Lane, Hicksville NY 11801.



Photo F. SBE 34.

defective converter crystal for that band, or a dirty band switch.

Most of the time these steps will get an old unit back on the air. If the unit

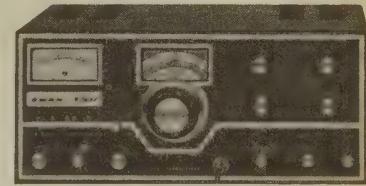


Photo G. SWAN 350.

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SEPTEMBER 1991 21

# upgrade... don't stop now!

by Gordon West WB6NOA

## Morse Code Made Fun

If you joined the amateur radio hobby with your new no-code license, you will want to start learning the code to pass the 5 wpm code test. Passing the code test at 5 wpm in front of three ARRL accredited volunteer examiners will open up the following additional bands for Technician-Plus privileges:

10 meters voice: 28,300 kHz–28,500 kHz  
10 meters data: 28,100 kHz–28,300 kHz  
10 meters CW: 28,100 kHz–28,500 kHz  
15 meters CW: 21,100 kHz–21,200 kHz  
40 meters CW: 7,100 kHz–7,150 kHz  
75/80 meters CW: 3,675 kHz–3,725 kHz

The 40 and 80 meter Novice CW bands are excellent for practicing your code to distant stations at night. Typical range is anywhere between 500 and 3,000 miles.

The 15 meter CW Novice subband allows you to communicate code to stations all over the world during daylight and evening hours. Ionospheric skip conditions may go until midnight for 15 meter, long-range contacts. Ten meters offers the most excitement for

Technician-Plus operators who pass the 5 wpm code test. Ten meter single sideband voice privileges give you 200 kHz of elbow room between 28,300 kHz to 28,500 kHz, where long-range daytime and early evening communications occur regularly for worldwide contacts.

That's right, you can go on the air with worldwide HF equipment on 10 meter voice from 28,300 to 28,500 kHz, and run up to 200 watts of power output. You can communicate all over the world regularly. You can also run RTTY and digital packet transmissions for worldwide contacts between 28,100 to 28,300 kHz. And you can make use of the propagation beacons between 28,200 to 28,300 kHz.

Upgrading to 5 wpm—or, for you Novice and Tech-Plus operators, to 13 wpm—is best done by listening to CW practice and communications at least three times a day. If you can't squeeze in some radio CW during lunchtime, arm yourself with a handful of code tapes. [You can order tapes from Uncle Wayne's Bookshelf or the Gordon West Radio School. Eds.]

Code tapes and live radio reception is a great way to learn the code and increase your speed for the next upgrade level.

If you don't know the code, use code tapes to assist you in learning the letters of the alphabet, the numbers, and the punctuation marks for period, comma, slant bar, and the break sign "BT." Listening to the instructions on the code cassettes will teach you to recognize the sound of the dits and dahs, and how these short and long sounds form letters and words.

But it's important to write it down, too, as opposed to simply saying the code out loud. Train your ear to tune into the code, and your hand to instinctively write down what each sound is.

If you forget a letter while copying code or taking a code test, don't stop to scribble down the dots and dashes. Just put a small tic mark on your paper for a missed letter. After you have completed your copy session, go back and try to figure out what the missing letter might be. Chances are, you'll be able to figure it out by looking at the letters around it. What is the most likely word the letters would form? Putting down the dits and dahs would just slow you down, and might make you miss the following letter as well.

### The Farnsworth Method

For the 5 wpm and 13 wpm examinations, the code characters are normally sent at a *character* rate of 15–18 words per minute. However, the spacing between words and letters is at the 5 and 13 wpm speeds, respectively. This is called learning the code by the "Farnsworth" method. The purpose is to learn the sound of the letter, number, or punctuation mark, at the higher speed. A character at 5 wpm sounds very different from the same character at 18 wpm. By learning the sound of the character at the higher speed to begin with, it's easier to upgrade later. The slower 5–13 wpm spacing rate between the characters gives the beginner time to write down what you have copied. And if you tune in the CW off

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is sent at the 18 wpm Farnsworth character rate. This may seem a little bit fast for your Novice test. However, some hams like this extra fast type of snappy code sending, with big spaces in between each character. If you like it this way, go for an ARRL-type code test.

The traditional way of sending code for 5 and 13 wpm is at a character rate of 15–16 wpm. This is a nice, quick sound, and there is still enough space in between each character to give you time to write down what you have copied. And if you tune in the CW off



Photo A. It's easy for no-code Techs to learn 5 wpm.

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#### Cut/Paste

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## Sample Exam Message

The test is preceded by a warm-up practice session which also allows for the adjustment of the tape player equipment. After the warm-up session, one of the examiners will announce that the test is about ready to begin.

VVVVVV N7TVK DE KAØDHO. BT

Tnx James. UR RST 489 489.

I am mobile in Colorado on my way to vacation at Disneyland in California. Name is Brian. Rig is a 200 watt ICOM and antenna is a 10 meter whip. I am 36 years old and my wife and kids are all General class hams. Occupation is a lawyer. The WX is freezing/cold and the temperature is 25 degrees. Must QRT to stop for some lunch. How copy? N7TVK DE KAØDHO AR SK

Code tests usually begin with a series of six V's, then the callsigns. Callsigns are sometimes hard to copy, but since they are repeated at the end, you have two chances to copy them. Try hard to get them; unlike a word, you can't guess at the missing letter in a callsign.

If you look carefully at this message, you will find that it contains all letters of the alphabet, numerals 0–9, and punctuation marks: the period, comma, question mark, sign-off signals AR and SK, the break or pause BT, and the slant bar DN. This complies with the FCC's requirements in Section 97.21(3)(b).

### Typical Questions

1. What was the callsign of the sending operator? (KAØDHO)
2. What was the name of the receiving operator? (James)
3. What was the RST report given? (489)
4. What was the QTH of the sending operator? (Colorado)
5. What type of transceiver was the sending operator using? (ICOM)
6. What type of antenna was the sending operator using? (whip)
7. What was the power output in watts of the sending operator's rig? (200)
8. What were the weather conditions at the sending operator's location? (freezing/cold)
9. What was the occupation of the sending operator? (lawyer)
10. Why did the sending operator go QRT? (to stop for lunch)

the airwaves, chances are you'll hear both types of CW being sent—Farnsworth and fast Farnsworth. You choose whichever one you like the sound of best, and make sure that your test will use the same code rate for the characters.

### Taking the Test

Since you are already a Technician Class operator, you must take the code test in front of three ARRL accredited volunteer examiners, or VEs. Some accredited VE teams will make up their own code tests on cassette, or they may elect to get their code test materials directly from W5YI or the ARRL. The W5YI is the National Volunteer Examiner Coordinator, or VEC.

The W5YI VEC code tests are at the 15 wpm rate, slower than the ARRL's 18 wpm rate. However, both use the Farnsworth method, with spacing down to the 13 wpm rate for General and 5 wpm rate for Novice.

The code test lasts approximately seven minutes. The volunteer examiners may be testing for all classes of amateur radio licensing. A Novice applicant who has no ham license can be tested for the 5 wpm rate by two General Class licensees. If you have elected to enter the hobby via the no-code route, you must be tested by three VEs.

The code test for both Novice and General will be a typical QSO from one station to another. See the sidebar for an example. If you look at this QSO carefully, you will see it contains every letter, every number, and the punctuation marks required by the FCC for a legal code test.

You don't have to necessarily copy

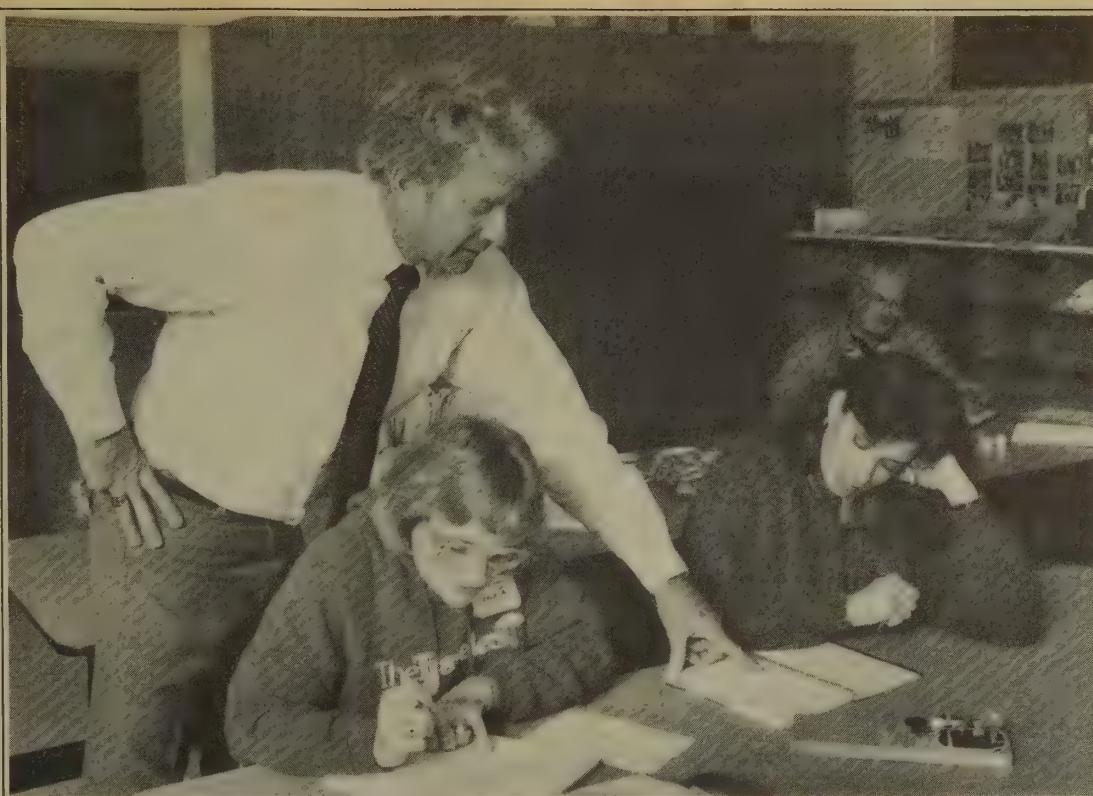


Photo B. Learning the code together in a classroom setting can be FUN!

the message 100 percent perfectly to pass. If you can get enough bits and pieces of the message, chances are that you can piece most of it together. As noted above, you can guess many words from the letters you did get. For example, can you fill in the missing letters in these words: \_NTENN\_, G\_NE\_AL, \_ATTS?

The exam will usually consist of 10 questions based on the material you

have copied. Generally, you pass if you get at least seven of the answers correct. You may also pass the test if the examiners can find a solid line of perfect copy one minute long. That's about 26 letters for Novice, or 65 letters for General.

The code test won't be a trick message. You won't find a QSO that reads, "Temperature is 98 degrees, and it's ready to snow." Just won't happen.

Nor will there be any deliberate misspellings, either.

Some volunteer examiners will also make the code test easier by offering multiple-choice answers to their 10 questions. Just recently, the ARRL relaxed their code test requirements, and now allow ARRL VEs to make their own tests, including multiple-choice code tests.

Find out ahead of time from your

VE team leader what the code test will be like—18 wpm or 15 wpm character speed? Multiple-choice or fill-in-the-blank? Are you permitted a couple of minutes after the test to look over your answers and fill in a missed letter or two? It's important to know the rules before you actually take your upgrade code test, because each team has its own way of giving the examination.

If you are new to the Amateur Radio Service as a Technician no-code licensee, begin learning the code characters with CW code learning cassettes. Supplement the cassettes with live CW reception from a high frequency receiver. Unfortunately, there is almost no code practice on the VHF or UHF bands except here in Southern California (Monday nights, 6:30 p.m., 144.330 MHz simplex).

Live and breathe live code practice over the air before you plan to sit for your actual upgrade code test. Try to copy code sent faster than what you can write down accurately. Push yourself to get a letter here and there at speeds 6 or 7 wpm faster than what might be on the test. This way, when you sit for the actual code receiving test, it will almost sound slow!

But do learn the code as your next step in upgrading—it's the amateur's international "secret language" and a kick to know when all those little dits and dahs finally begin to form a real message coming out of your pen or pencil. If you practice 20 minutes in the morning, 20 minutes at noon, and 20 minutes in the afternoon, your coming upgrade will be an easy pass. Good luck!

RF

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# try something new

by Bill Brown WB8ELK

## Amateur Satellites

Orbiting the earth are over a dozen satellites that are very unique (currently 14 in operation if you count the *Mir* space station). These are amateur radio satellites put up as piggyback payloads during commercial launches. They are called OSCAR (Orbiting Satellite Carrying Amateur Radio). Some allow two-way communications using the satellite in much the same way as a repeater. Others send back telemetry, voice messages, or pictures. There are even a few that operate as an orbiting packet BBS (bulletin board system). You can leave a message on one of these satellite BBSs and someone on the other side of the world can read the message at a later time.

## What Equipment is Needed?

Some of these satellites require you to have a fairly extensive array of equipment to get the most out of them. For example, to use the highest satellites (OSCARs 10 and 13), you would need an all-mode (SSB, CW and FM) transceiver or transverter (which converts an HF radio to VHF and UHF) capable of operation on 2 meters and the 70 cm band (435-438 MHz). A good antenna system (with preamp) which you can steer in elevation as well as azimuth (Az-El mount) will make it possible to track these satellites. Some of the new Microsats also require you to add a PSK modem and a packet TNC to your station. That way you can receive the telemetry in-

formation and picture transmissions (in the case of WEBERSAT), and also use the orbiting packet BBS systems.

The thrill of being able to talk to anyone over a large portion of the world, with the knowledge that you can reliably communicate at precise times, makes this well worth the effort. You no longer have to depend on a chancy ionosphere to talk around the world. Contacts are possible that would rarely occur on the HF bands. For example, let's say you're located in New York. You could talk to Japan, Europe, California, Vermont and Pennsylvania all at the same time. Not only that, all stations would be pretty much the same signal quality and everyone would hear all sides of the conversation. Just try to do that on 10 meters!

## Easy-to-Receive Satellites!

OK, it takes some effort to put together a fully capable OSCAR ground station. Don't let this discourage you. Some satellites are ridiculously EASY to hear and track. Using nothing more than a 2 meter HT (handie-talkie), a 2 meter FM home station, or a 10 meter HF rig, you can impress your friends by receiving signals directly from space!

## UOSAT

The University of Surrey in England has quite an impressive curriculum which allows their students to design and build their own satellites. They now have three of their satellites cur-

rently orbiting the Earth (UO-22 was launched just this past July). Their UOSAT-11 has an output on 145.825 MHz FM. It is in a low polar orbit and comes over several times a day. You can receive its signals for as long as 20 minutes during each pass. Although it usually outputs 1200 baud ASCII telemetry signals, they sometimes have it talk using an onboard voice talker module. Nothing like a talking computer from space to thrill visitors to your shack!

## DOVE

As part of the Microsat program, Junior Torres de Castro PY2BJO of BRAMSAT (the Brazilian AMSAT group) proposed a very unique satellite to help stir the imagination of students all over the world. The DOVE (Digital Orbiting Voice Encoder) satellite was designed to transmit down on the same frequency as the UOSAT bird. It currently sends down packet telemetry on 145.825 MHz FM and can be received on just about any 2 meter FM station (or scanner for that manner). The only interface needed to receive the telemetry is a standard packet TNC and a computer to display the information.

You can watch the voltage on the solar panels change with varying sun angles during its orbit, look at temperature readings in several locations inside the satellite, and look at the output of dozens of sensors. It is really quite fun to watch the solar panel voltage change when the satellite crosses over into night. One nice display program for the IBM PC that allows you to show all of the telemetry in an informative real-time display is called WHATS-UP (see the table).

One other feature that is sure to be popular when it comes on-line is the onboard voice talker. Voice messages from students all over the world will be selected periodically and uplinked via packet to the satellite by the DOVE control station. In addition, voice bulletins will be issued. These high quality voice messages will play back during each orbit, and can be easily received worldwide.

## Easy Soviet Satellites

The Soviets have put up a number of easy-to-use amateur radio satellites (the RS series). Three of these are particularly suited to the satellite beginner: RS-10/11, RS-12/13, and RS-14. Usually requiring only a 10 meter HF receiver and a 2 meter all-mode transceiver (you might be able to use your FM transmitter as a CW signal), they are a great way to start getting your feet wet in the world of two-way satellite communications. There is also a fourth satellite—the *Mir* space station (more on that later).

## RS-10/11

To receive the downlink signals from the RS-10/11 satellite, listen be-

tween 29.360-29.400 MHz (SSB or CW). You can hear the CW telemetry downlink on 29.357 MHz. You transmit up to RS-10 (uplink) between 145.860 and 145.900 MHz (SSB or CW). You can use your 2m FM transmitter as a CW transmitter if you disconnect your microphone and key the PTT (Push-to-Talk) line. Be warned that some rigs will sound chirpy when keyed this way. Since these are low-orbiting satellites, you don't need a lot of signal to transmit through them. It only takes about 10 to 25 watts of power to a simple antenna to work through one of the RS satellites. Good results can be obtained with an omnidirectional antenna, a turnstile antenna, or a small beam. A dipole or turnstile will work well for your 10 meter receive station (a preamp will help in some situations).

## RS-12/13

This Soviet satellite usually is set up in what is known as mode K or KT. RS-12/13 can be heard between 29.410-29.450 MHz. The CW beacon is on

29.408 MHz. To help out those satellite enthusiasts with no VHF equipment, the RS-12/13 uplink is on 15 meters between 21.210-21.250 MHz! Occasionally RS-12/13 will be on mode KT, which provides an additional downlink between 145.91-145.95 MHz.

## Talk to an Orbiting Robot

One neat feature of the RS satellites is the robot operator. You can hear the RS-10/11 "robot" on 29.403 MHz. Just transmit CW up to the robot on 145.820 MHz at about 17 wpm. For example, if you were WASZIB, you would send the following as perfectly as you can: RS10 de WA5ZIB AR. If the robot hears you, it will call you and give out a serial number! The RS-12/13 satellite also has a robot with an uplink on 21.129 MHz (the Novice band). The robot transmits down on 29.454 MHz.

## Mir

Here's your chance to link up to a live cosmonaut in the orbiting *Mir*. *Continued on page 30*

## information sources

The following is a list of satellite groups, publications, and equipment manufacturers that will help you get into the world of satellites:

### AMSAT-NA

850 Sligo Ave., #600  
Silver Spring MD 20910-4703  
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Membership entitles you to the *AMSAT Journal* (bi-monthly) as well as discounts to a wide array of software and books.

### Satellite Operator

R. Myers Communications  
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### Oscar Satellite Report

R. Myers Communications  
P.O. Box 17108  
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\$29/yr. bi-weekly  
\$56 for both Satellite Operator and OSR

### Satellite related software:

InstantTrak 1.0—tracking software for IBM PC (EGA or better); available from AMSAT-NA.

Quiktrak 4.0—tracking software for the IBM PC (monochrome or higher); available from AMSAT-NA.

Whats-Up—Real-time display of DOVE telemetry (and other Microsats). Available for \$35 from Joe Kasser G3ZCZ, P.O. Box 3419, Silver Spring MD 20918.

### Books:

*Satellite Experimenter's Handbook*; available from AMSAT-NA, Uncle Wayne's Bookstore, and the ARRL.

*A Beginner's Guide to Oscar 13*; available from AMSAT-NA.

*PACSAT Beginner's Guide*; available from AMSAT-NA.

*Decoding Telemetry from the Amateur Satellites*; available from AMSAT-NA.

*Weather Satellite Handbook*; available from AMSAT-NA, Uncle Wayne's Bookstore, and the ARRL.

### HF Information nets:

East Coast AMSAT net—Every Tuesday evening at 9 p.m. Eastern on 3.840 MHz.

Central States AMSAT net—Tuesday evening at 9 p.m. Central on 3.840 MHz.

West Coast AMSAT net—Tuesday evening at 9 p.m. Pacific on 3.840 MHz.

International AMSAT net—Sundays at 1900 UTC on 14.282 MHz.

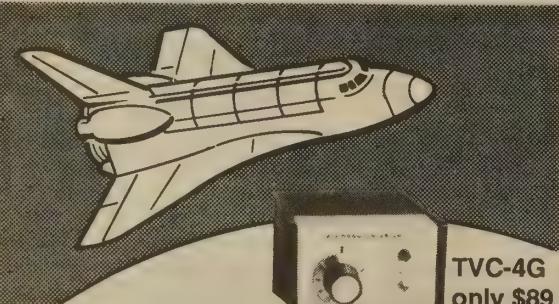
AMSAT net—18.155 MHz at 2300 UTC on Sundays.

### Phone line BBSs with satellite info:

DRIG (Dallas Remote Imaging Group)—(214) 394-7438.

Celestial BBS—(513) 427-0674.

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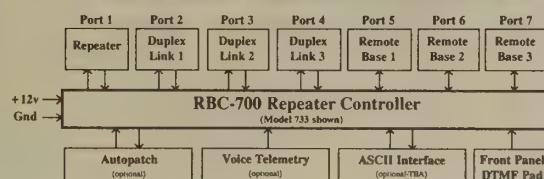
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Several models are available and are software configurable to support up to 3 Repeaters, 5 Duplexed Links, and 4 Remote Bases. A group or club can start with the basics and expand their controller anytime by simply adding boards and software. Free software upgrades for one year after delivery. Finally, a real controller for the Linked system operator !

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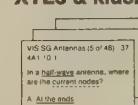
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# Watts 'n' SWR

Stop guessing. Build this no-nonsense VHF/UHF wattmeter and save your hard-earned cash.

by Peter Putman KT2B

Here's a project everybody can use—a cheap, reliable wattmeter that can be used anywhere from 50 to 500 MHz. It uses an etched-line circuit for coupling and has two power ranges. Additionally, it can be calibrated to measure SWR!

The idea for this project grew out of discussions the Split Rock ARA had back in 1980 concerning a possible club project. Among the many ideas kicked around was one for such a wattmeter, although at the time an unrealistic figure of \$15.00 for the total cost was anticipated. The project never got off the ground.

I stuck with the concept, and over the years tinkered with various designs. Somewhere in the past I had stumbled upon a circuit that used an etched transmission line and coupler, so a trip to the technical archives in the attic revealed what I needed. The big problem was that the etched line was nowhere near 50 ohms! This wouldn't do at all. After all, what good is a 500 ohm wattmeter?

Additional research revealed that the dimensions of a 50 ohm stripline etched on G-10 epoxy board were close to 1/10 inch in width, with any length usable. After confirming this with Steve Katz WB2WIK, I began carefully etching test boards in the darkroom using precision rulers and masking material cut with an X-acto knife.

After about four prototypes, I had a board which, when connected between two BNC connectors (using the unetched side of the board as a ground plane), exhibited no reflected power on a Bird Model 43 wattmeter connected in series and terminated at 50 ohms. I had done it! Now to the nuts and bolts of the circuit!

I should clarify any additional comments by saying that this unit is really a bi-directional coupler. As such, it can be used to measure SWR or power—whichever you prefer. It samples a small amount of RF on the transmission line through a coupling line which is terminated in the middle. At either end, type 1N60 diodes are used to rectify this small sampled voltage. Add a few switches, pots, and a meter. And that's it!

As I just mentioned, RF energy traveling on the 50 ohm section from input to output is sampled by the -30 dB coupler—sort of like winding a link coupling at HF frequencies. D1 and D2 can be almost any kind of point-contact diode, but the best choice would be a 1N60, due to the bet-

ter performance characteristics at VHF/UHF.

The sampled, rectified DC voltage

different readings will be evident on different bands for the same power level measured.



Photo A. Front view of the wattmeter.

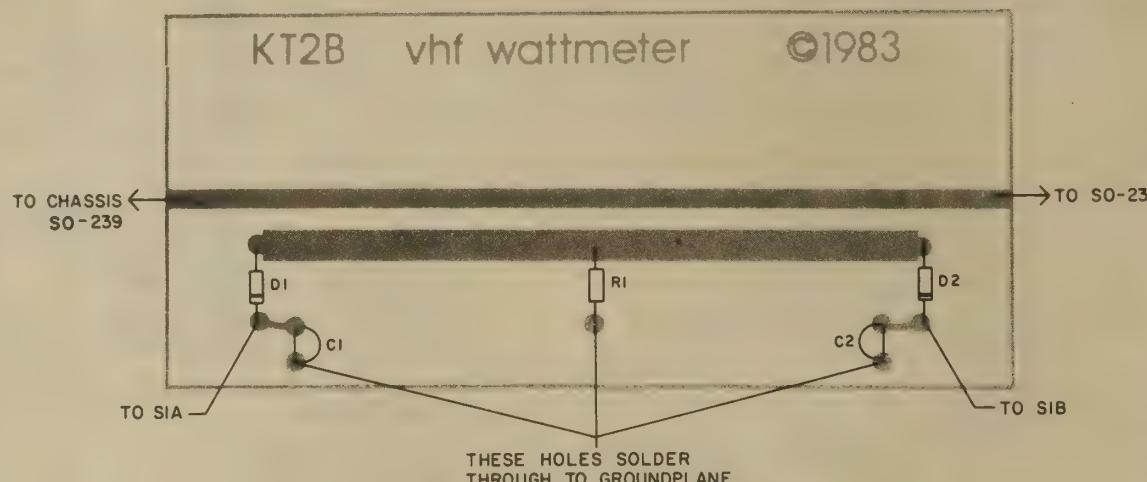


Figure 1. PC board overlay for parts (except where indicated, all parts are soldered to the top side).

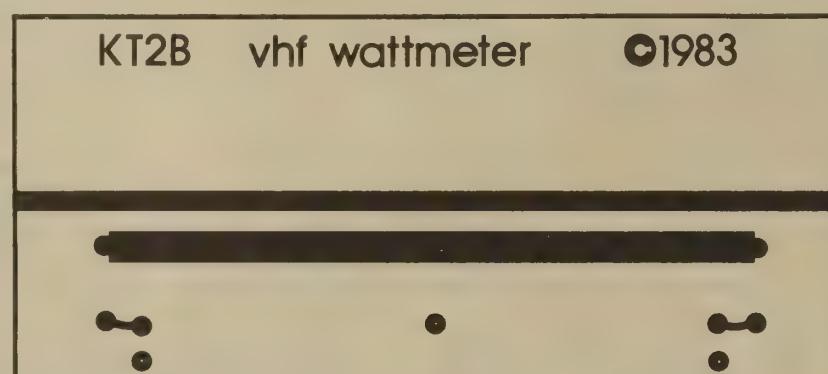


Figure 2. Master art for PC board (use a double-sided circuit board).

is then routed to R2 or R3 via SPDT switch S1. These two potentiometers set power ranges or can be used to set frequency ranges. Note that as with most wattmeters that use coupling lines, the degree of coupling rises with the frequency chosen and decreases with a lower frequency, so that dif-

Also note that while the actual power measurement and its relation to the meter scale is a function of a logarithm, the relation between decades of measurement is a linear function. This allows the use of one meter scale on any band. Power levels up to 500 watts can be measured accurately with this unit—typically within 10% of a Bird 43 wattmeter—but I haven't tried anything higher. Teflon board would be a better choice for higher power levels.

R1 on the sampling line functions as a termination, and you may have to tinker with it a bit to determine coupling characteristics. I found a value of 27–33 ohms to be fine. C1 and C2 function as RF bypass capacitors. The best way to mount the PC board is to suspend it between two connectors, either type SO-239 or a BNC female.

with all components as shown in Figure 1, along with appropriate lengths of wire to connect to each switch. Install the side connectors of your choice along with about 1" of braid or finger stock for the ground connection. Finally, install the completed PC board by suspending it between the center pins on the connectors, and then soldering the center pins to the 50 ohm etched line. Solder the braid to the back of the double-sided board.

Calibration can be achieved with use of a known, accurate bridge or wattmeter, such as a Bird 43. Set the unit up to the ranges you desire by adjusting the 10-turn pots, R2 and R3. For example, you may wish to measure the output of two mobile rigs; one with 25 watts at 146 MHz and one with 10 watts at 440 MHz. Or, if you wish, you can add additional trim pots for additional ranges.

I have included in Figure 3 a template for a wattmeter scale that can be used instead of the 50  $\mu$ A scale on the meter. Remove the meter face carefully, using a screwdriver to pry it off. Next, using extreme care not to bend the meter movement, work a small knife or screwdriver under the metal scale on the unit. Pry gently around the corners until it pops free, then slide it out. Use this metal scale as a template to cut the supplied scale to size. Use double-sided tape on the face to hold in your new scale. Snap the cover back on and you're in business.

As was stated before, accuracy has been measured to within 10% or better of a Bird 43 on the desired frequency. If you want, you can remove the meter and remote it, leaving the coupling unit in its own box. This could be handy for mobile installations!

RF

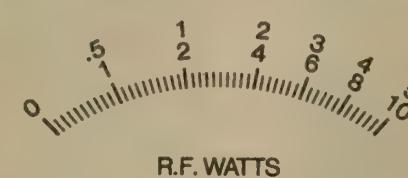


Figure 3. Meter scale for 50  $\mu$ A meter.

## parts list

D1,D2	1N60-type diode or similar	Mouser # 333-1N60
R1	33-ohm, 1/4-watt resistor	Mouser # 29SJ250-33 or Radio Shack
R2,R3	15-turn, 3/4-watt, 5000 pot	Mouser # 594-43P503
S1,S2	SPDT Miniswitch	Mouser # 10TC510 or Radio Shack
C1,C2	2 disk capacitors, 0.001 50V	Mouser # 21RX510 or Radio Shack
J1,J2	SO-239 (or BNC) female chassis mount connectors	Mouser # 16SO239 (SO-239) or ME164-93094N (BNC), Radio Shack or Nema Electronics
M1	50 $\mu$ A movement	A.R.E. # 6500003
Case	LMB TF-780 case	Mouser # 537-TF-780 or Radio Shack equivalent
P.C. Board		See note below

Note: Mouser parts can be ordered from (800) 346-6873. The meter is available from A.R.E., 15272 S.R. 12E, Findlay, OH 45840. (419) 422-1558.

A blank PC board is available for \$4.50 + \$1.50 shipping from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

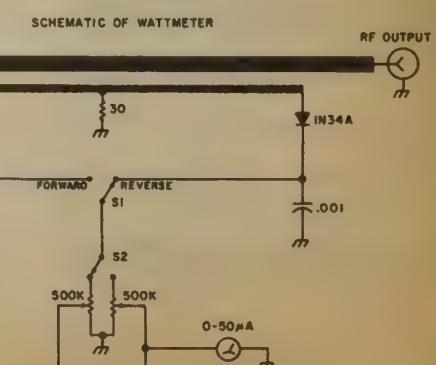


Figure 4. Schematic.

You may reach Pete Putnam KT2B at 3353 Fieldstone Dr., Doylestown PA 18901.

This article originally appeared in the September 1984 issue of 73.



# Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The Radio Fun Flea Market costs you peanuts (almost)—comes to 10 cents a word for individual (noncommercial) ads, and 70 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested.

Send your ads and payment to Radio Fun Flea Market, Sue Colbert, Forest Road, Hancock NH 03449 and get set for the phone calls.

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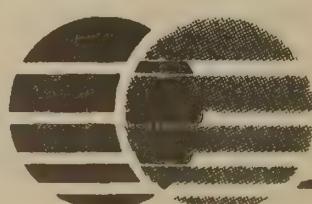
RF959

**FREE Ham Gospel Tracts**, SASE, N3FTT, 5133 Gramercy, Clifton Hts. PA 19018.

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# Ham Stories

## Responses to Wayne's request for exciting moments in ham radio.

**Carty Ellis KA2Y (ex K2OES), Rochester NY** You wanted to know about some of the more exciting moments in ham radio. There have been enough exciting moments to keep me involved in this hobby for 30 plus years... from age twelve to my current 45. The toughest part of that challenge you pose is zeroing in on my most exciting or memorable moment.

There are many aspects to the excitement this hobby provides: my fascination with technology and gadgets, the escape that was provided a young person with bad asthma in a small town, covering the world on the air waves, that perennial need to be the biggest kid on the block, or the fastest gun (bug) in the West, and the general love of learning I have always had. I pray I keep going till I pass on to the big station in the sky.

Where do I begin? My first contact? My first exposure to ham radio? The first time I felt 800 volts in my arm (or the second—who says we learn from our mistakes!)? Hearing Barry Goldwater's station running phone patches to Southeast Asia in 1967? Coming home from a hamfest last summer with a Collins S-line station under my arm (who was a ham in the sixties that didn't drool over a Collins S-line station)?

Or maybe I should start with my first AMTOR contact or packet connect; then there's the day I passed my Novice exam, and the times I upgraded to Technician; General; Advanced; Extra. And how about the day I sat in my car with 10 watts, 2 meter FM in Rochester, New York, and chatted through a Detroit repeater? The day I accessed a local remote base with my 2 watt handheld from the car and chatted with a station in the Netherlands?

Or the day I delivered my first MARSGRAM to a lonely wife? The day my son KS2Z got his first license, or the day he got his Extra? The day I sat down and had a QSO using a station as old as I was—a Collins 75A1 receiver and a Collins 32V1 transmitter? Listening to the 3898 Gator Traders Net on a National SW-3 receiver. For those of you who don't know, that receiver has three tubes and was "top shelf" in the mid '30s.

These last two items led me to many fascinating and fun visits, which the XYL enjoyed too, such as a trip to the Antique Wireless Museum in Holcomb, New York, where I actually heard a syncro-spark transmitter on the air.

I could go on and on because I have such a magical treasure chest in my mental attic that is fun, and yes, sometimes melancholy, to open and rummage through, and maybe that is why I always turn to your editorials first, Wayne. You too have some great memories of people and places and experiences. Some I even share, like hearing W2OY "No kids, No Lids, No Space Cadettes, No Phonies, etc.," calling CQ on 75 phone. I heard him when I was a Novice here in upstate New York, in a little town called Penn Yan on beautiful Keuka Lake, with a

Knight Kit Ocean Hopper regenerative receiver that I built from a kit (with the gentle help and guidance of Paul Durham, now a Silent Key. Paul was my Uncle's Elmer, too—in 1934) and a 75 watt oscillator using a 6146 as an oscillator from the 1957 *ARRL Handbook*, when they had stuff real people could put together....

As I look back over this quick list, I think I have found my most important moment. My Uncle Woody (George Wagstaff W8AZW of Willowick, Ohio) came to visit my mother and me one summer evening in 1957. He was then K6JZN, living in Hayward, California. I can see my mother and aunt standing beside the car, while Uncle Woody started the engine and turned on his Morrow Twins. People were talking TO EACH OTHER! Uncle Woody picked up the microphone off the dashboard, and called a station, where I do not remember, but the voice in the radio said hello to ME! This was probably the most magical moment I ever had. And then when he said I could do that too.... I don't think I came down for about two days. Someday I am going to own a pair of Morrow Twins, too.

A few weeks later, after he had returned to California, he sent me some books on how to get started in amateur radio. Going through those books was spellbinding. It was way back then that I knew that someday I would have that Amateur Extra Class ticket. Uncle Woody sure is owed a lot for the years of fun (and all the money I've spent) that he started me on.

**Douglas Byrne G3KPO, Ryde, Isle of Wight, England** Reference your "biggest thrill" request in the January 1991 issue of 73. Doubtless you will get some fantastic, wonderful, and right-out-of-this-world replies. The one that sticks in my mind is so mundane that I hardly think it's worth writing about. And yet, it will always remain one of my happiest memories of 35 years in hamming.

Some few years ago, I was idly tuning round the then quite new Novice band when I heard a very weak, very slow, and extremely hesitant CQ call. Returning the call at the same speed, I eventually found the young apprentice was a 13-year-old girl, who was right-over-the-moon because I had gone back to her call from faraway England—for her *first ever* QSO outside the states. It had obviously made her day, as it did mine, and the kid followed it up with a lovely little letter and QSL card.

**Rene Matthijsse VE6WCA (ex PAØYS), Edmonton, Alberta, Canada** It must have been around 1965. I had just received my ham radio license, and I was very proud of my call: PAØYS. My good friend Jeroen was also very much interested in the hobby, so he and I quite often worked together on projects.

The newspaper was full of rumors that we were to get a commercial pirate TV station. It was to be built on an old oil drilling platform just off the coast of Holland, with a power of 120 kW and an antenna height of 300 feet. It was financially supported by selling one million shares to the Dutch public at 25 guilders (\$10 dollars) per share. Everyone was excited about it since Holland only had one government TV station that broadcast three hours per day and not on Mondays!

Jeroen and I quickly built a solid state test pattern generator (checkerboard!) and a 10 watt transmitter on TV chan-

nel 11, and put it on the air. Immediately, the papers were full of people claiming that they had seen the pirate TV station (wrong pirate). Orders started pouring in for outside TV antennas. We installed 90 of them in a few weeks! Nobody noticed the difference when the pirate TV station, called REM, finally came on the air. Of course, some of the antennas had to be turned around, since they were pointing in the wrong direction. We lived in the middle of Holland, while REM was in the North Sea. Everyone accepted this as normal "fine tuning" of the antenna.

We had a lot of fun doing this—until the Dutch government shut REM down.

Another memorable event was in the late '50s, when foxhunting was done on 80 meters. My father helped me build a "portable" radio. It consisted of a battery tube-type superhet and QSL card.

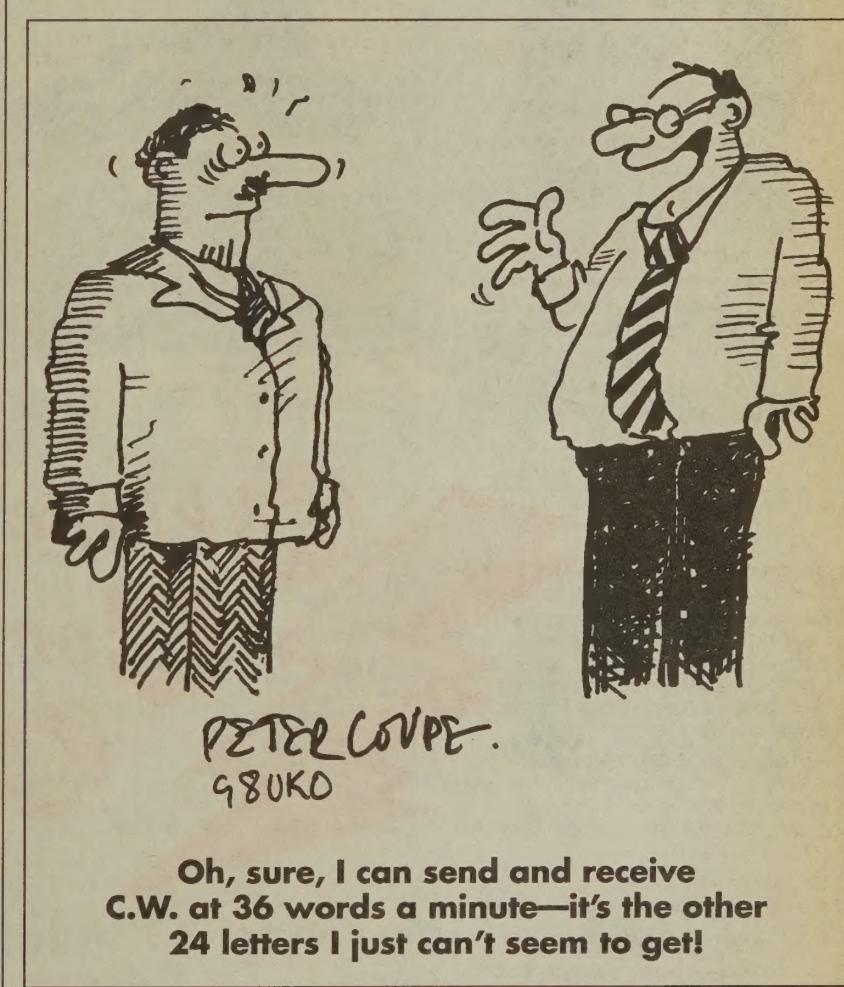
erodyne receiver with a loop antenna. The high voltage was 135 volts. The cabinet was made out of steel plate.

Very shortly after the receiver was completed, during one of the foxhunts, one of the high voltage wires touched the filament wire. The tubes glowed brightly for a split second!

The receiver was built like a battleship, and one day it fell down the stairs in an apartment building. After falling down three stories, the antenna was slightly bent. But it still worked.

Everything was fine until it started to rain. Since the headphones were directly connected to the plate circuit, a full 135 volt DC was applied to the ears! Try that while hanging onto a metal cabinet.

The answer was to find a transformer and a 50 ohm headphone. That solved the "curly" hair problem. **RF**



Oh, sure, I can send and receive  
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## try something new

Continued from page 24

space station! They now have a 24-hour packet BBS in operation on 145.55 MHz. If you're already on packet radio, no additional equipment is needed. Just tune into 145.55 MHz during one of the passes and try to connect to U5MIR-1 (for the BBS), or try to hook up live with one of the cosmonauts (use U5MIR without the extension). The signals are very strong, and you only need a modest station to connect up to the station. Say hello to the cosmonauts as they zip along

overhead. By the way, if the *Mir* station is passing over at one-half to one hour or so after sunset or before sunrise, you have an excellent chance to actually spot them visually in the sky! *Mir* appears as a bright fast-moving spot of light that will fade out as it hits the earth's shadow. I've actually seen the sun reflect off of *Mir*'s solar panel array in just the right angle to produce a spectacular bright flash.

### RS-14/OSCAR-21

Although requiring some additional equipment for the 70 cm band (435-438 MHz SSB or CW), you'll

find this to be an excellent satellite because of its exceptionally strong signal. There have been numerous reports of mobile or portable operation using minimal antenna systems and average power. The uplink is between 435.102-435.022 MHz with a downlink between 145.852-145.932 MHz. The CW beacon is on 145.822 MHz, and is a good place to start looking for this satellite. Another transponder is used a lot with slightly different frequencies: 435.123-435.043 MHz uplink, 145.866-145.946 MHz downlink. The CW beacon is on 145.948 MHz.

### How to Find Satellites

You should use a computer tracking program to predict when a particular satellite will be in range of your location. The two most popular ones for IBM compatibles at this time are InstantTrak 1.0 and Quiktrak 4.0. You need to input Keplerian elements into these programs and some information about your location. You can then predict very accurately when satellites are coming over and where to point at them in the sky. Both of these programs are available from AMSAT-NA (see the address in the sidebar).

These satellite element sets are available from local packet BBSs as AMSAT bulletins, phone line BBSs such as DRIG (Dallas Remote Imaging Group) at (214) 394-7438, the Celestial BBS at (513) 427-0674, or from the several weekly HF AMSAT nets (see the table for net times and frequencies). The DRIG BBS carries all of the AMSAT bulletins as well.

Another excellent source of information can be found each month in 73 in the Hamsats column by Andy MacAllister WA5ZIB.

### The Final Frontier

It is really quite a thrill to hear signals from space. It never ceases to amaze me that I can hear a satellite with just my 2 meter HT. With the array of satellites currently in orbit, you have a wide variety of modes and capabilities. Depending on which satellite you want to operate, your ground station could be just a 2 meter HT or something resembling NASA mission control! Several new satellites with even more amazing modes are in the works. Give a listen to some of these satellites. I think you'll like tuning in to the final frontier.

RF

You may contact Bill Brown WB8ELK at 73 Magazine, Forest Road, Hancock NH 03449.

### easy to use satellites

The following is a list of the easiest satellites to operate (only the most commonly used frequencies are listed):

#### RS-10/11

Mode A

Downlink: 29.360-29.400 MHz, SSB or CW  
Uplink: 145.860-145.900 MHz, SSB or CW  
Beacon: 29.357 MHz

#### RS-12/13

Mode K

Downlink: 29.410-29.450 MHz, SSB or CW  
Uplink: 21.210-21.250 MHz, SSB or CW  
Beacon: 29.408 MHz

Mode KT is activated occasionally and adds a 145.91-145.95 MHz downlink in addition to above.

#### RS-14/OSCAR 21

Transponder 1

Downlink: 145.852-145.932 MHz, SSB or CW  
Uplink: 435.102-435.022 MHz, SSB or CW  
Beacon: 145.948 MHz

Transponder 2

Downlink: 145.866-145.946 MHz, SSB or CW  
Uplink: 435.123-435.043 MHz, SSB or CW  
Beacon: 145.948 MHz

Note: These are inverting transponders. When you go up in frequency on the uplink, you will be relayed on a lower frequency on the downlink. This helps to reduce Doppler shift.

#### DOVE

Downlink: 145.825 FM, packet telemetry and digitized voice messages.

#### Mir

Up and Down: 145.550 MHz, packet BBS and occasional voice contacts. Callsign currently is U5MIR-1 for BBS and U5MIR for direct contacts.

*One man's junk  
is another man's treasure!*

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See page 28 for details!

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IC-2410

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pines, and all others with  
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**sim·plic·i·dent** — *n.* A simplicidentate rodent.  
**sim·plic·i·ty** (sim-plis'e-tē) *n.* pl. -ties 1 The  
state of being simple; freedom from admixture,  
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difficulty; sincerity; unaffectedness. 2 FT-26 or  
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*<Med. L. simplificare* *<L. simplex* simple +  
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